REPORT OF THE
NATIONAL COMMISSION ON AGRICULTURE

1976

PART XI

RESEARCH, EDUCATION AND EXTENSION

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND IRRIGATION
NEW DELHI

PREFACE

The Report of the National Commission on Agriculture comprises 69 chapters in 15 parts. A complete list of chapters and parts is given in pages (ii) and (iii). The Terms of Reference of the Commission and its composition are given in Part I - Chapter 1 - Introduction.

This volume entitled 'Research, Education and Extension', is Part XI of the Report and is divided into the following three chapters :

52. Research
53. Education
54. Extension

Aspects relating to forestry research and education are dealt with in chapter 46 of Part IX and those relating to irrigation research in Chapter 15 of Part V.

REPORT OF THE
NATIONAL COMMISSION ON AGRICULTURE

PART VIII - FISHERIES

PART IX - FORESTRY

PART X - INPUTS

PART XI - RESEARCH, EDUCATION AND EXTENSION

PART XII - SUPPORTING SERVICES AND INCENTIVES

PART XIII - RURAL EMPLOYMENT AND SPECIAL AREA PROGRAMME

PART XIV - PLANNING, STATISTICS AND ADMINISTRATION

PART XV - AGRARIAN REFORMS

PART XI

RESEARCH, EDUCATION AND EXTENSION

CONTENTS

CHAPTER 52 RESEARCH

CHAPTER 53 EDUCATION

SECTION

R E S E A R C H

52

RESEARCH

1 INTRODUCTION

52.1.1 In the process of applying science to achieve specified goals, technology is the tool or knowhow. Science is knowledge which is more or less universal, but the tool or technology is determined by the nature of the goal to be achieved. Depending on the latter as well as on the availability of resources there may be alternative technologies, the final choice of one among them being determined by feasibility, economics of operation and other socio-economic or even political considerations. One of the goals in agriculture is higher and more improved and diversified production. In order to achieve this a number of disciplines or sciences and diverse kinds of resources have to be deployed in a planned and systematic manner in the right channels. When a farmer finds in his possession the seed of a variety of, say, wheat having certain desirable characteristics, he hardly realises that this is the result of hard and sustained labour on the part of a band of scientists belonging to such diverse disciplines as genetics, plant breeding, plant physiology, agronomy, irrigation, soil chemistry, soil microbiology, entomology, pathology and a host of others. When a new and effective plant protection chemical makes its appearance in the market, the consumer is unlikely to be aware of the scrupulous search and studies that have gone into its making by a host of chemists, plant physiologists, agronomists, entomologists, pathologists and ecologists. If any other similar item of interest in

agriculture is taken, it will be found that a number of disciplines have impinged on it. Each of these products of science and technology contributes in its own manner to the development of agriculture, and becomes itself a centre of growth.

52.1.2 Multidisciplinary approach makes the application of science and technology meaningful. Even though research is one, there is an advantage in dividing it into categories according to certain accepted criteria and allocate responsibilities of carrying out each category by individuals or teams or institutions most competent for the purpose. This general formulation applies in particular to agriculture which is intrinsically amenable to a multidisciplinary approach. The successful application of science and technology depends on the number and quality of men, materials and other resources and above all their management with which are interwoven the economic conditions of the society and its attitude towards a scientific and technological solution of its problems. Science and technology isolated from the social and economic milieu of the country are, therefore, unimportant.

52.1.3 Science and technology as applied to agriculture during the colonial rule were harnessed for serving essentially the interest of the rulers rather than the ruled. The concomitant benefits included an awareness amongst the educated of the importance of science and technology in the overall development of the country. However, the establishment of the Indian Council of Agricultural Research (ICAR) was a significant landmark. After Independence, the awareness took

more concrete shape, and the massive growth of science and technology in the country has been the result. The widespread influence which the various research organisations exert on the growth, direction and development of agriculture in general and of agricultural research in particular in the country demands that their activities and performance are carefully reviewed. The problems of management and administration of research have assumed new dimensions in the context of the rapid and extensive growth of science and technology commensurate with their applications in the varied fields of agriculture. The mobilisation of the scientific and technological resources of the country in the right direction requires fresh and objective thinking. These ideas and the issues raised above have been elaborated in this chapter.

2 CATEGORIES OF RESEARCH

52.2.1 For the purpose of defining the categories of research and the scope of each we quote below from our Interim Report on Some Aspects of Agricultural Research, Extension and Training (SAARET). "A chain of processes is involved starting from research and ending in production and it is necessary to assume some kind of demarcation before the agencies involved in various processes are specified and made responsible for different aspects. For instance, taking an overall view of agricultural research, one must recognise that it cannot be compartmentalised artificially into one kind of research or the other. However, the demarcation of research into categories may be rewarding in the sense that it may avoid confusion and save a good deal of overlapping in efforts. Keeping this limitation in mind, three categories of research have been distinguished, viz., (i) basic or fundamental research, (ii) applied research, and (iii) adaptive research.

52.2.2 "Basic or fundamental research has either an intellectual, exploratory or gap-filling function or all of them in one. It is carried out solely to increase our stock of knowledge. Such topics as genetic factors determining yield potential; effect of radiation on biological materials, physiology of nutrient absorption; structure of humic acids, sex attractants for control of pests, etc. constitute subjects of fundamental research. Physiological and biochemical requirements of cultivable fish; genetic studies and antigenic analysis of bacteria and viruses are also examples of basic research in the field of fishery and veterinary science

respectively.

52.2.3 "Applied research is directed to attain a practical goal which may often be defined precisely, by the application of known basic principles. Sometimes applied research may throw up problems for fundamental research. Examples are: determination of the yield potential of a variety; efficiency of fertiliser use; effective form of nitrogenous fertilisers in different agro-climatic regions; soil test-crop response relation; finding out the best type of food for fish as per physiological and biochemical requirements; studies on keeping quality of rinderpest vaccines under different conditions and duration of immunity in vaccinated animals, etc."

52.2.4 "Adaptive research also called 'on-farm-testing' or 'field verification trials' starts from the proven results of applied research and carries them forward to a wider field of application by evaluating, adjusting or orienting the results of research to a specific locality or situation. Exploitation of the productivity potential of a variety, economics of local agronomic practices; specification of a suitable variety of long-staple cotton for a particular climatic zone; choice of a drought-resistant or disease-resistant variety; determining variety of fish suitable for a specified water temperature; trials for efficiency of tissue culture strain of rinderpest virus etc. are examples of adaptive research. In essence, adaptive research is to refine and develop a precise package of practices for a given set of conditions in a local situation."[1]

52.2.5 After having defined these categories of research we have studied the organisational characteristics and

1. Paragraphs 2.2 - 2.5 of SAARET.

resource positions of the different agencies which are capable of doing agricultural research in the country. We have considered the possible apportioning of research responsibilities among these various agencies so that optimum benefits are derived. Our conclusions and recommendations in this regard are contained in the Interim Report on SAARET. We quote below the relevant portions from that Report and reiterate the recommendations made therein.

Fundamental and Applied Research

52.2.6 "The academic climate of universities is always most congenial to the pursuit of knowledge for its own sake and hence universities are the best places for fundamental research. However, the agricultural universities have generally not been able to undertake fundamental research so far. In the interest of agriculture, it is essential that they should pay immediate attention to this aspect. One of the possible reasons for lack of attention to fundamental research may be that it takes time for fruition, if at all, and, therefore, for quick recognition scientists naturally take to applied or adaptive research. It is also felt that fundamental research, though needed, is not the responsibility of agricultural universities, which are required to attend to mission-oriented research having in view practical utility only. The lack of high calibre research personnel competent to conduct fundamental research may be another reason. This lack generally arises because our present system of research is project-based and, therefore, time-bound. In such jobs of temporary tenure, very few competent persons are attracted and those who are attracted have to shift from place to place after the closure of projects.

52.2.7 "The situation as regards fundamental research is similar in the central research institutes, some of which, though well equipped with men and materials, have not formed themselves into excellent centres of fundamental research.

52.2.8 "There is urgent need to encourage development of specialised centres of fundamental research in different parts of the country, which would be capable of tackling problems that are basic in nature. The best places where such centres could be developed are naturally universities in general and the agricultural universities in particular. Central institutions of the ICAR are also places where such centres could be developed. One of the ways to encourage universities to develop such centres would be the setting up of professorial Chairs by the ICAR.

52.2.9 "It is equally desirable that institutes for fundamental research are also the places for applied research, because there is an essential need for a healthy symbiosis between the two. Agriculture represents such a science where laboratory trials must be tested at field level in all kinds of climatic combinations. Facilities for applied research are often demanding and may not be available in all places of fundamental research. A university, for the purpose of its applied research programmes, will require the help of farms which are adequately equipped for such work. State regional stations are ordinarily located in different agro-climatic regions and some are also well equipped. Therefore, these appear to be ideal for this purpose of applied research. Some of these research stations should be placed at the disposal of the universities in such a manner that they have at least one

such station for each type of climatic region. Where more than one research station in each agro-climatic region have already been transferred to the university in any State, this need not imply retransfer of any of the research stations to the State departments. If any climatic region does not have a station, it is desirable that this gap is removed by opening a new station. The universities should then be able to build them up with their research staff and facilities. Required number of extension personnel should also be located at such station."[1]

Adaptive Research

52.2.10 "Adaptive research is usually to be done on an extensive scale, and in most cases consists in making suitable adjustments and modifications of certain findings in order to suit specific situations. Extension being the next step to adaptive research, economic considerations often become deciding factors in the choice of one technology in preference to another. In some of our researches, this economic aspect is lost sight of and consequently such researches become infructuous. In view of the diverse needs of adaptive research, the state departments possessing, as they do, adequate resources and wide jurisdiction throughout the agro-climatic regions of their States - are most competent for carrying out adaptive research. While making this observation the Commission would like to re-emphasise that agricultural universities shall be fully responsible for basic and applied research in agriculture, animal husbandry and related sciences and the universities must be given adequate facilities and funds for

1. Paragraphs 4.1 - 4.4 of SAARET.

discharging their obligations as the scientific consultant and adviser to the Departments of Agriculture, Animal Husbandry, etc. The State departments should confine themselves only to adaptive research such as varietal testing, fertiliser recommendation based on soil analysis, water duties, etc. and must not use this freedom to develop parallel research organisations in competition with the universities. As mentioned earlier, adaptive research needs imagination and experience of a varied nature. The structure of State departments and quality of their personnel should therefore be such that they should be capable of discharging well their responsibilities. In fact, their expertise should not in any way be inferior to that of the universities. Unless the strengthening of staff of State departments is made in this way, the objective of adaptive research, i.e., the process of leading research to its production goal cannot be achieved.

52.2.11 "Adaptive research to be carried out by State departments has to be based on applied research work done in the universities and central institutions. It is, therefore, necessary that those in charge of adaptive research programmes in the departments keep themselves continuously in touch with the developments in the corresponding disciplines in the universities. It will also be of help if the senior scientists of the universities are able to advise the departments on their annual programmes of work in adaptive research. For this purpose, there must be Adaptive Research Council in Government departments similar to the Research Council obtaining in agricultural universities and in these Councils the senior university experts should also find a

place. The advice of these experts should be given full consideration in planning adaptive research programmes of the Government departments.

52.2.12 "In the past, when the State departments were in full charge of research and education, a research worker was generally not involved in administrative or extension work. But now if the adaptive research is to be meaningful, research workers too must have a full knowledge of extension problems of the field and of administration which is necessary for any extension programme. Thus a system must be evolved in the State departments whereby research personnel also have the experience of administration and extension work so that they have the necessary field experience to back up their research.

52.2.13 "State experimental farms which usually are meant for demonstration work and for raising seeds etc. should be exclusively under the control of the State departments, which can utilise them for their adaptive research and extension work. But agricultural universities should not be precluded from using them, if required."[1]

52.2.14 After a package of practices is evolved through adaptive research, it is still necessary to try it over wider areas to find out the economics of the entire operation, and finally demonstrate its efficiency to the farmers. This step has been distinguished as operational research in the chain of agricultural research. For this, the ICAR has launched a massive programme.

Multidisciplinary Approach

52.2.15 A characteristic feature of the growth of science is

---

1. Paragraphs 7.1 - 7.4 of SAREТ.

its continuing fragmentation into specialised disciplines. Universities and other higher institutions of learning and research have gradually encouraged this fragmentation and become basically discipline oriented. But the division into disciplines appears somewhat artificial and irrelevant in the face of the fact that science cannot be applied to solve problems of food, population, housing, transport, communication, etc. without bringing some of the disciplines together. Experience, insight and knowledge are required to ascertain what disciplines are relevant to solve a particular problem. Here lies the basic need of a multidisciplinary approach not only for the development of technology but also for transferring it to the field for the purpose of production. Just as a single discipline may have a variety of applications in a multiplicity of programmes, so does a single programme involve multiplicity of scientific disciplines, together with managerial, financial and commercial support for its successful culmination. Multidisciplinary approach which is mission-oriented is, therefore, particularly relevant to agricultural research and development. In multidisciplinary approach each discipline is organically linked with the other, such that any lacuna or weakness in any of these linkages renders the entire chain either infructuous or unstable. The principal drawback in the developing countries, such as India, lies in the weakness of the link between technology and production. Because of this, the progress is stalled in spite of a vast accumulation of scientific knowledge and of manpower. As a result, stagnation has also set in in the process of transformation of science into technology.

Insofar as national economy is concerned, or even economy in a narrower field, production is geared to demand and marketing in a competitive sense. Technological and hence scientific research as well have, therefore, to take this into consideration and be prepared to offer suitable modifications and alternatives. There is, thus, scope for continuous adjustments in the chain of processes starting from research to production and marketing, as and when situation may demand. This is the underlying philosophy of any multidisciplinary approach to achieve goals, and so in agriculture.

52.2.16 The capability of a nation to carry out sustained multidisciplinary research is measured by its scientific and technological potential (STP) which in turn depends on the quality and not merely the quantity of trained personnel. Four factors are considered essential for multidisciplinary research namely, excellence, relevance, participation and organisation. Where persons of adequate and appropriate qualifications are no available, the first and foremost thing would be to organise their training.

52.2.17 Relevance of science and technology to productivity requires a clear definition of goals within the framwork of national science and economic policies. Research and development should be so interwoven that each finds the other relevant. For this purpose a built-in mechanism for evaluation is imperative.

52.2.18 Participation of users in and their association with science and technology lend a new dimension to multidisciplinary research. This is more meaningful in the case of agriculture,

in which a close association between scientists, extension workers and farmers is essential. In tne process of transfer of research in different disciplines as they obtain in multidisciplinary research, the organisational aspect is no less important. In order to accelerate work on applied research it may be more economical to allow cooperative competition, which is often discouraged, to avoid duplication of efforts.

52.2.19 In the context of the needs and limitations of resources, consideration of two factors, namely, critical mass and selective strategy as applicable to research and development becomes relevant for a developing country. The expression, "critical mass" borrowed from the field of atomic energy, conveys the idea that unless a requisite number of adequately qualified research workers are made available in one place, successful results cannot be obtained. But no quantitative and qualitative specifications have been worked out in this regard. Even though the number is the main criterion of critical mass, one must bear in mind that proper research facilities, congenial research environment and suitable research incentives are equally important. In fact, the latter are often so decisive that the lack of one of them cannot be compensated by increasing any other incentive and the research effort may not at all reach "criticality".

3 HISTORICAL BACKGROUND

52.3.1 It is long since the Imperial Bacteriological Laboratory was established at Poona in 1889 and the Imperial Agricultural Research Institute was established at Pusa (Bihar) in 1905 and from then conscious efforts were made to apply science and technology to solve problems of animal and crop production. Now there are a whole array of research institutes covering the entire range of agricultural disciplines under the auspices of the Indian Council of Agricultural Research, a network of agricultural universities throughout the country and a number of auxiliary organisations to help transfer of research results to the field. Majority of these research and development infrastructures have evolved since Independence, but the tempo of growth has been more rapid during the past decade and a half. It will, therefore, be of interest to take a stock of what the achievements have been, and to what extent they are commensurate with the investments. We have not attempted to make the review exhaustive but have brought into focus some of the important events in the field of research in agriculture, animal husbandry and fishery. Forest research has been dealt with in Chapter 46 on Forest Planning, Research and Education.

52.3.2 Early efforts by the British rulers to improve agriculture were prompted, by the need to export wheat, cotton, jute, tea and other raw materials. Recurrence of famines and the devastation that followed focussed attention on measures to prevent or mitigate them. The thoroughgoing reports of

the famine enquiry commissions were eye openers. They recommended that conscious efforts were necessary to introduce scientific agriculture, if any permanent improvement was desired. The establishment of the Department of Agriculture at the Centre was the beginning of a series of developmental steps taken in the matter of improvement of agriculture and animal husbandry in the country. The establishment of the Pusa Institute and the appointment of experts in various fields further strengthened and consolidated the ground for research work in agriculture. To the Pusa Institute were later attached other research institutes concerned with animal nutrition, breeding, dairying, sugarcane breeding etc. The Veterinary Research Institute at Izatnagar/Mukteswar became an active centre of veterinary research. Soon after, the organisation of agricultural research started in the Provinces. After a temporary setback caused by the World War I the progress of agricultural research in the Provinces gradually picked up.

52.3.3 In spite of the creation of (a) Department of Education, Health and Lands in which the Department of Agriculture was merged later, (b) a strong centre of agricultural research at Pusa, (c) veterinary research at Mukteswar/Izatnagar, (c) Agricultural and Veterinary Departments in the Provinces, and (d) the provision for research and education in agriculture and veterinary science in the Provinces, low productivity in the fields of crop production and animal husbandry was the characteristic feature in the sphere of agriculture. In the context of

this situation and the growing demands on land, the Government of India constituted the Royal Commission on Agriculture (RCA). The RCA observed that the impact of agricultural research done in the provinces was far too small and that the Agricultural Research Institute at Pusa was unable to cope with the task of organising agricultural research all over India. With the transfer of agriculture to the Provinces the jurisdiction of the Institute became limited. Moreover, the geographical difficulty of approaching the Institute for solving problems of the Provinces stood in the way. In addition, the expertise available in the Provinces increased considerably in number as well as in quality since the establishment of the Institute, and it was no longer necessary for the Provinces to depend exclusively on the Institute for assistance. The RCA then analysed the pros and cons of three possibilities:
(a) dividing up research into compartments by forming crop committees; (b) transferring control of Pusa to a quasi Government body; and (c) constituting a new organisation to which the Institute at Pusa and those in the Provinces would stand in the same relation. Some of the crop committees, it argued, were doing very well, but one committee could not possibly, manage for the entire country all aspects and answer all problems connected with one crop. The second possibility was not favoured observing that the importance of the Institute and the eminence it attained would be minimised if it were handed over to a quasi Government body.

The RCA argued its way to recommend the establishment of a new organisation which while discharging its responsibilities as an all India body would represent in various ways provincial interests as well. It recommended that this new organisation which it called the Imperial Council of Agricultural Research would be provided with adequate funds for a comprehensive study of agricultural and veterinary problems through the institution of fellowships and scholarships and suitable financial assistance to universities and other research organisations. It was to have its own journal to serve as a clearing house for research information. The establishment of the Council in 1929 by the Government of India following this recommendation was the most significant step in the field of agricultural research.

52.3.4 The great depression of the thirties and the World War II and its aftermath and the Bengal Famine brought home more and more clearly the truth that production must be increased if the country was to survive from famine, hunger, malnutrition and disease. There was considerable spurt in research and developmental activities throughout the country. To mention a few, there were: (a) the Grow More Food Campaign, (b) the setting up of a fertiliser factory, (c) Central Tractor Organisation, (d) Policy Committee on Agriculture following the formation of a separate Department of Agriculture, (e) inland and marine fisheries institutes,

(f) Indian Dairy Research Institute, (g) Commodity committees like those of sugarcane, tobacco, coconut, oilseeds, (h) Rice Research Institute and (i) fertiliser trials according to the recommendations of A.B. Stewart. E.J. Russell gave a comprehensive report in 1937 on the working of the Imperial Council of Agricultural Research vis a vis the position of agricultural research in the various institutes in which researches on agricultural and allied subjects were being carried out. The report distinghished three stages in the application of research to solve agricultural problems, namely, basic, applied and extension. It was surprising, according to Russell, that in spite of considerable expenditure of efforts on the part of well trained scientists and of money, the research results were of little practical value and a large gap was discernible in the matter of translating results of research from the laboratory and even from small plots to large fields, so that many of the experiments reported were not acceptable to farmers. A review initiated by the Council of the research efforts and achievements in the field of animal husbandry during the period 1929-1947 reveals that a considerable amount of research material was available on animal breeding, nutrition and disease, dairy industry, sheep and wool and poultry.

52.3.5 Before the thirties, the Provinces were themselves concerned with agricultural research and were directly involved in applying the results of research to specific

problems. The Central Institute of Agricultural Research at Pusa was for various reasons not in a position to cater to the needs of all the Provinces, and hence the latter were gradually building up their own expertise. Having regard to the freedom of the Provinces to choose research programmes according to their needs and resources, the RCA was cautious to suggest an all India approach in such matters as soil survey and erosion, fertilisers, manures, seed production and distribution, crop varieties, pests and diseases, implements and machinery and dryfarming. The recommendations were rather addressed to the Provinces on specific issues. In spite of this, the recommendation concerning the establishment of the Council of Agricultural Research with necessary powers and functions and responsibilities paved the way for the Central Government to substantially dominate agricultural research in the Provinces. The RCA suggested that the ICAR should consider establishing some research substations at agro-climatic zones to cater for regional needs. It did not envisage universities to be meant exclusively for agricultural research but did see reason to involve universities for the purpose of promoting agricultural research and creating training facilities in basic sciences for agricultural scientists. The RCA favoured the setting up of crop committees, especially for cash crops, in view of the need to concentrate all scientific efforts and for all round development in the fields of production, processing

and marketing. The trend of a cautious and conventional approach pervaded all spheres of activities, but at the same time the concept of a scientific basis of agriculture was by and large well realised. The wide distribution of scientific research efforts in agricultural disciplines under the auspices of the ICAR and Provincial Governments stems from this realisation. The review reports by E.J.Russell, N.C.Wright, W.Burns and others covering the thirties lend support to this contention.

52.3.6 The period covering the forties was spent mainly in consolidation of the achievements made and bases created in agricultural and animal husbandry research, in filling up gaps, wherever urgently necessary, and in surveying the situation for future strategy and planning. A number of crop committees (arecanut, sugarcane, tobacco, coconut, oilseeds) sprung up during this period. In animal husbandry the main thrust was on improvement of draught and milch cattle through breeding, feeding and health cover and strengthening the Indian Veterinary Research Institute with the establishment of animal genetics division. Fishery development was boosted up as a result of the setting up of a research institute for marine and another for inland fisheries.

52.3.7 A great upsurge of development in all spheres of national activities including agriculture marked the fifties and sixties as a result of the institution of five year plans. The First Plan was mostly concerned with correcting imbalances in food and fibre production created by the partition of the country. Owing to a relatively smooth performance of

agriculture in the First Plan, it was accorded relatively low priority in the Second Plan, except that towards the end the Intensive Agricultural District Programme (IADP) was launched, which was aimed at concentrating efforts and resources on particular areas. This and the Intensive Agricultural Area Programme launched later were intended to optimise resources and inputs and at the same time to act as visual demonstrations of what scientific agriculture was capable of performing. Infrastructures for seeds, credit, fertilisers and storage were built up to support the developmental activities. The Third Plan was disturbed considerably as a result of Chinese and Pakistani incursions and the calamitous drought of 1965-66. At this point of time two major events, though not related, occurred, which augured well for agricultural research. The one was the reorganisation of the Indian Council of Agricultural Research (ICAR) with the appointment of a scientist to head it, and the other was the introduction of the exotic, high yielding and short duration dwarf variety of Mexican wheat. Not only was food production boosted up by the latter event but the entire research strategy for crop improvement through genetic manipulation received a new orientation. Problems connected with the introduction of new crop varieties were challenging and created new avenues for researches in agronomy, plant physiology, water management, plant protection etc.

52.3.8 The scheme of the Intensive Cattle Development Project (ICDP) in crop development had as its objective a

breakthrough in milk production by provision of package of practics and marketing. Cross breeding programme with exotic cattle for genetic improvement was another feature of this scheme. As a result, considerable research efforts were called for in breeding techniques, feeds and fodder and animal diseases. Crossbreeding was also the main instrument of improvement in sheep for wool and meat, poultry for egg and meat, and piggery for meat. Each of these species had its specific problems not only in the matter of breeding but also in developing feeds and health cover.

52.3.9 Researches on inland fishery with the principal aim of increasing productivity were going on. Developmental projects required strengthening of their efforts and diversifying them to suit varying conditions in the country. Marine fishery and designing fish craft and gear and development of fishery technology called for relevant research efforts.

4 THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH

52.4.1 The Imperial Council of Agricultural Research set up in 1929 in pursuance of the recommendation of the RCA was renamed the Indian Council of Agricultural Research (ICAR) in 1947. It was set up as a Society in July 1929 under the Societies Registration Act with certain broad objectives as laid down in its Memorandum of Association. The original resolution of May 1929 outlined the objectives of the ICAR as follows:

> "(a) Promotion, guidance and coordination of agricultural and veterinary research throughout India. The Council would not, however, maintain research institutions directly under its control nor would it employ its own staff of experts. If would merely determine whether a particular scheme of research was of all-India or of local importance and whether it would best be carried out at an Imperial or Provincial research institution or individual and would then, after subjecting the same to examination by expert advisers, make grants as it considered suitable;
>
> '(b) the training of research workers under a scheme of research scholarships or other ways;
>
> '(c) the collection and dissemination of information in regard not only to research but to agricultural and veterinary matters generally; and
>
> '(d) the publication of scientific papers etc."

However, in 1930 the Government of India decided at first to make the Council an attached department, but later on in 1939 rescinded the decision to give it freedom to make its own rules and procedures as envisaged by the RCA. It, however, remained as an 'attached' office of the Government of India.

52.4.2 Initially the Imperial Council of Agricultural Research, in furtherance of its objectives sanctioned ad hoc grants to research institutes, universities and other research organisations. It had no research institutes under its own control. The RCA did not envisage the establishment of research institutes under the control of the Council. Instead, Central crop committees on the pattern of the then existing Central Cotton Committee were suggested by the RCA. The linkage between the Council and the crop committees was provided by making the Vice-President of the Council as the President of the crop committees. In course of time lacunae in this kind of arrangement began to tell upon its efficiency. Moreover, such researches as pertain to soil, agronomic principles, or on general disciplines like genetics and breeding, plant pathology, plant biochemistry, etc. did not find their due place. Mention has already been made of substantial amounts of research materials on crops and animals (especially their diseases) being available in various Central and State research institutes and organisations and university laboratories, but much of them were of no practical value.

52.4.3 In addition to agriculture being a State subject, the Constitution of India provides the following matters specially in the State list:

i) agriculture including agricultural education and research, protection against pests and prevention of plant diseases;

ii) preservation, protection and improvement of stock and prevention of animal diseases; and

iii) veterinary training and practice.

The responsibility of the Central Government is covered by following Entry in the Union List:

"Coordination and determination of standards in institutions for higher education or research and scientific and technical institutions".

52.4.4 Some State Governments, in fact, did build up good research organisations of their own, which were relevant to their needs. In other States, agricultural research and education were sadly neglected by the State Governments most often because of paucity of funds. As such the Central Government, through their research institutes and commodity committees and directorates, largely supported their agricultural research base.

52.4.5 The agricultural research situation in the country as a whole was far from satisfactory. In recognition of this overall view and of the need to reorganise agricultural research the following expert teams were constituted to examine the various aspects of agricultural research, education, extension and administration and to recommend ways and means of improvement:

(i) the First Joint Indo-American Team on Agricultural Research and Education (1955);

(ii) the Agricultural Administration Committee-Nalagarh Committee (1958);

(iii) the Second Joint Indo-American Team on Agricultural Education, Research and Extension (1960);

(iv) the Committee for Agricultural Universities Legislation - Cummings Committee (1962); a

(v) the Agricultural research Review Team (1963).

Since they covered the same areas, some of the important recommendations of the review committees were similar. But they received scant attention of the Government insofar as their implementation was concerned. The Agricultural Research Review Team being the last had the advantage of the earlier reviews and recommended a complete reorganisation of the ICAR and an overhaul of agricultural education. The University Education Commission (1949) had earlier suggested a reorientation of agricultural education somewhat on the pattern of the Land Grant colleges of the USA and recommended the establishment of rural universities. The first step in this direction was taken up by the Uttar Pradesh Government when it set up the Agricultural University at Pantnagar in 1960, with the help of ICAR grants and support from United States Agency for International Development (USAID) and collaboration of the University of Illinois. This was followed by other States in quick succession. Even though aimed at a uniform pattern throughout the country according to a Model Act proposed by the ICAR the agricultural universities in the different States developed some characteristic differences depending on the attitude and approach of the State Governments and the authorities of the universities concerned, though keeping more or less the same broad pattern.[1] The ICAR by virtue of being the financing source could influence greatly the pattern of these universities. A uniformity of pattern can

1. Vide SAARET pp.12-15.

still be maintained by allowing a certain degree of flexibility to accommodate suitable modification on the basis of further experience.

52.4.6 Based on the recommendations of the Agricultural Research Review Team which submitted its report in March, 1964, the Government of India took rather prompt action to reorganise the ICAR in a number of ways. The Government decided as follows:

(i) The re-organisation of the Indian Council of Agricultural\Research by bringing under it all research institutions under the control of the Ministry of Food and Agriculture;

(ii) the re-constitution of the Governing Body of the ICAR by making it pre-eminently a body of scientists and those with interest of knowledge in agriculture;

(iii) financial assistance for research to State research institutes and other research institutions such as Universities being given in the form of block grants on the model of the Atomic Energy Commission;

(iv) agreeing in principle to the Indian Agricultural Research Institute, New Delhi, Indian Veterinary Research Institute, Izatnagar (Uttar Pradesh) and National Dairy Research Institute, Karnal (Punjab) being designated as National Institutes and taking up the necessary legislation therefor;

(v) the adoption of personnel policies particularly with reference to the exclusion of Clss I and Class II posts in the ICAR and in the institutes under it from the jurisdiction of the Union Public Service Commission;

(vi) the formation of a Cabinet Committee for Agricultural Research;and

(vii) agreeing in principle to the appointment of two Officers on Special Duty, the case being processed separately through the Ministries of Finance and Home Affairs as required under the Transaction of Business Rules.

52.4.7 Following reorganisation, the objectives of the ICAR were revised as follows:

(i) to undertake, aid, promote and coordinate agricultural and animal husbandry education, research and its application, development and marketing to increase scientific knowledge of the subjects and to secure its adoption in every day practice;

(ii) to act as a clearing house of information not only in regard to research but also in regard to agricultural and veterinary matters generally;

(iii) to establish a research and reference library with reading and writing rooms and to furnish the same with books, reviews, magazines, newspapers and other publications; and

(iv) to do all other things as the Society may consider necessary, incidental or conducive to the attainment of the above objectives;

52.4.8 The revised objectives, especially (i) and (ii), are in conformity with the responsibilities given to the ICAR by virtue of the above Government decision. Accordingly, all the Central research institutions which were under the control of the Union Ministry of Agriculture and Food were transferred to the ICAR. These and all the commodity research institutes became constituent units of the ICAR. The pending ad hoc schemes sanctioned by the commodity committees were eventually accommodated in the all India coordinated research projects. The Chief Executive of the Council was designated as the Director General and an agricultural scientist was appointed to this post. He was assisted by a number of senior scientists belonging to various disciplines and specialisations, and by administrative and financial staff at the appropriate level. The Council was to have in addition the expert advice of scientists in specific fields. All recruitments and promotions pertaining to the institutes earlier routed through the Union Public Service Commission were, as a result of reorganisation, made by the ICAR itself.

This step was suggested to enable expeditious selection of the right person of the right discipline/specialisation for the right place.

52.4.9 The authorities and officers of the ICAR Society are (a) Governing Body, (b) Standing Finance Committee, (c) Advisory Board, (d) Standing Committees, (e) President of the Society, (f) Director General, (g) Secretary, and (h) such other authorities/officers as may be constituted/appointed by the Governing Body under/or the Government of India. At the time the ICAR was reorganised in 1966, it had a membership of 180 representing various interests related to agriculture.

52.4.10 Recently some organisational changes have been introduced to streamline administration and make it more purposive. These were outlined by the Vice-President of the Society while inaugurating on October 2, 1975, the Agricultural Research Service as follows:

> "We have made the Society more compact and specifically related to its scientific and educational charter. The Union Minister for Agriculture and Irrigation is the President of the Society and I have the privilege of being the Vice President. The Society will be assisted in its task by a Governing Body headed by the Director General of ICAR. The Governing Body has in its membership eminent agricultural and other scientists, Vice-Chancellors of Agricultural Universities, Directors of ICAR Institutes, and the Secretaries of the Government of India in the Ministries of Finance (Department of Expenditure), Planning, and the Department of Agriculture in the Ministry of Agriculture and Irrigation. The Chairman of the University Grants Commission is also a member of the Governing Body since ICAR has responsibility both for agricultural research and education. The Governing Body in its turn is assisted by a Norms and Accreditation Committee for dealing with matters relating to Agricultural Universities, a Standing Finance Committee and eight regional committees. The regional committee is a new

innovation and reflects the desire on the part of our Society to go into greater depth into problems of a local and regional nature and more particularly into problems of tribal and neglected areas. The Society is also assisted by a large number of scientific panels representing the various disciplines of agriculture, animal sciences, fisheries and social sciences. Another important feature introduced by ICAR into the scientific fabric of our country is the organisation of several inter-organisational panels such as separate joint panels with the Indian Council of Social Sciences Research, the Council of Scientific and Industrial Research and the Indian Council of Medical Research. The Society is also planning to organise a joint panel involving CSIR, ICMR, the Bhabha Atomic Research Centre, Defence Science Organisation, India Meteorological Department, and other relevant scientific organisations. We consider this to be necessary because agriculture is the primary industry of our country and all scientific organisations in our country are involved in some way or the other with problems of agricultural and rural development. Therefore, the getting together of these agencies to undertake joint projects on a cost-free and cost-sharing basis is exceedingly important. We feel with these changes the ICAR headquarters would be in a better position to keep track of the major research problems requiring our attention and to develop a right sense of priorities. Since farmers will be represented in all regional committees their practical wisdom would be of great benefit in the formulation of research priorities.

"At the level of the Institutes, which are really the centres where research plans have to be converted into accomplishments, it is proposed to set up Management Committees with effect from this month. The Management Committee headed by the Director should be able to take decisions on most matters relating to the implementation of the approved research programmes and thereby serve as an effective task implementation body. The Management Committee will be assisted by Grievance Cells which are already functioning in most Institutes and Joint Councils which are proposed to be set up shortly. Working scientists will be represented on the Management Committee and thus a collegiate system of decision making can be fostered."

52.4.11 The latest staff position in the ICAR is as follows:

Scientific Personnel -	
Director General	1
Deputy Director General	4
Assistant Director General	18
Project Officer	2
Scientist	19
Junior Scientist	4
Assistant Scientist	5
Assistant Statistician	1
Senior Technical Assistants	22
Administrative Staff	638
Total:	714

The Scientific Panels

52.4.12 The scientific panels of the ICAR constituted by the Director General in consultation with his scientific colleagues and advisers are currently grouped as follows:

Plant Breeding

Plant Physiology and Biochemistry

Plant Pathology

Entomology

Nematology

Horticulture

Animal Breeding

Animal Diseases & Pests

Animal Nutrition & Physiology

Animal Products Technology

Dairy Science

Fisheries

Soil Science and Microbiology

Agronomy

Agricultural Economics, Statistics & Marketing

Agricultural Sciences Technology

Fruits, Medicinal Plants, Plantation Crops & Vegetables and Floriculture.

The members of the panels are chosen on the basis of their expert knowledge in the subjects concerned from universities, research institutes - Central, State and private. One of the members is appointed by the Director General as the Chairman. The functions of the panels, unless otherwise laid down by the Director General for a particular panel, are in general as follows:

(i) To review periodically the research work carried out in the country and in the Indian Protectorates etc. in their respective disciplines.

(ii) To suggest measures, for the coordination of research activities so as to avoid duplication of efforts and to ensure the maximum utilisation of available resources.

(iii) To make recommendations for improving the conduct of research pertaining to production, grading, preservation, transportation, maketing and utilisation of agricultural produce and animal products.

(iv) (a) To examine and assess from respective scientific, technical and technological angles the research schemes that are being financed by the Council out of the Council's Cess Funds.

(b) To examine and assess the Technical Programmes of work, annual progress reports and final reports in respect of the schemes mentioned above and to give their recommendations.

(c) To offer comments and advice from the point of view of overall coordination in their respective disciplines on the programme of work and the annual progress reports of all India coordinated projects and of Central research institutes.

(v) To suggest:

(a) Coordinated programmes of research in their respective disciplines and the institutions or centres where it may be taken up.

(b) Model coordinated schemes/projects of research.

(c) Priorities for the research schemes/projects recommended.

(d) Ways and means for improving the work under the schemes/projects of research pertaining to their respective disciplines.

(vi) To advise on the following:

(a) Problems on which research work needs to be intensified or undertaken;

(b) results which require to be tested through pilot projects/schemes or pilot plants, or passed on to extension workers for adoption by the farmers, the trade and the industry;

(c) closure of schemes which are not working satisfactorily or have reached a stage where further work is not necessary;

(d) such problems as may be placed before them; and

(e) all such other matters as may be referred to them by the Director General/the standing committees/the Advisory Board and the Governing Body."

52.4.13 In regard to the scientific panels' activities we reiterate the recommendation made in SAARET, which reads as follows:

"The ICAR should, with the help of its scientific panels, undertake to draw long-term plans of fundamental and applied research, identify gaps in our information and assign them for execution to appropriate scientists, universities, and research institutes".

While some panels have taken pains to identify gaps and priorities of research, as enjoined by the ICAR, others have not applied their mind to the extent expected of them. The ICAR does not appear to have taken serious congnisance of either the panels' suggestions or their negligence. This is one of the most urgent tasks to which the ICAR should address itself. Careful considerations would, therefore, be necessary at the time of the constitution of the panels. When a panel identifies gaps or problems and suggests projects to tackle them, adequate followup action would have to be ensured to achieve speedy implementation of panels' suggestions. The panels should also allocate, on a priority basis, research responsibilities to universities, research insitutes and individual scientists.

Ad hoc Research Schemes

52.4.14 In dealing with ad hoc schemes, the scientific panels should similarly make themselves more purposive and in this they should be provided with adequate administrative supports from the concerned offices of the ICAR. We consider it necessary to mention that the researches completed under ad hoc schemes are worth compilation in suitable forms, otherwise they are lost and forgotten. Some of these researches are known to find place in doctoral thesis and research publications and hence their merits are adjudged, and as such are of considerable scientific value.

52.4.15 An approximate idea of the shares of ad-hoc financial grants received for research by the ICAR institutes, agricultural universities and the general universities can be obtained from the data available for ad hoc schemes

sanctioned in 1974-75 as presented below:

(Rs lakhs)

	Animal sciences	Crop sciences
ICAR institutes	86*	236**
agricultural universities	138	162
general universities	51	57

These figures speak for themselves. The share of the general universities has been curtailed, as expected, and that of the agricultural universities increased. In crop sciences, the share of the ICAR institutes is more than the agricultural and general universities combined, of which IARI alone has got more than half the total share of all the ICAR institutes. In animal sciences, the agricultural universities occupy a favourable position. This does not take into account the *ad hoc* schemes granted (Rs 9 lakh) to the Madras Veterinary College which has recently been transferred to the Tamil Nadu Agricultural University. Of the ICAR institutes, the share of Indian Veterinary Research Institute (IVRI) is the highest being about 25 per cent of the total.

---

* IVRI alone 20

** IARI alone 125

52.4.16 The subjectwise distribution of sanctioned grants may be seen from the figures given in Table 52.1.

Table 52.1

Subjectwise Sanctioned Grants for *ad hoc* Schemes for 1974-75 in Animal Sciences and Crop Sciences

(Rs lakhs)

	Total sanctioned	Received by agricultural universities	Percentage of 3 to 2
1	2	3	4
animal sciences			
animal breeding	47	94	51
animal diseases & pests	79	50	63
animal nutrition & physiology	69	44	64
animal products technology	23	3.9	21
dairy science	13	10	77
fisheries	51	1	1.9
economics, statistics & marketing	13	2.9	22
crop sciences			
agronomy	3.2	1.8	56
soil science & microbiology	41	21	51
fruits, medicinal plants, plantation crops, vegetables and floriculture	100	29	29
plant breeding & genetics	52	25	48
plant physiology and biochemistry	58	10	17
entomology	36	16	45
plant pathology	42	20	48

Table contd.

Table 52.1 (contd)

1	2	3	4
nematology	18	13	72
agricultural engineering	18	18	100
agricultural science technology	25	2	8
agricultural economics, marketing & agricultural statistics	51	3	5.3

In some of the subjects nearly 45 to 65 per cent of the grants have gone to the agricultural universities. It is more than 70 per cent in dairy science, nematology and agricultural engineering - in the last subject almost all the schemes are from the agricultural universities, outside of which reserches on agricultural engineering are not apparently being carried out at present. From the percentages of schemes sanctioned it appears that researches on animal products and agricultural sciences technologies, economics, statistics and marketing in both animal and crop sciences, fruits, vegetables, etc. Plant physiology and biochemistry and fisheries are at a low key in agricultural universities, the lowest, 1.9 per cent only, being in fisheries. Most of the remaining sanctioned grants have either gone to the ICAR institutes or the general universities, the share of the former being usually much larger, especially in crop sciences.* The agricultural and general universities, and especially the former, are entitled to a larger share of research grants in those subjects in

* Vide tabular statement in Paragraph 52.4.15

which they are still deficient. Attempts should be made to sponsor a larger number of research schemes on those subjects.

52.4.17 Because the data analysed refer to a single year, the results of analysis do not admit of anything but very broad conclusions. Even then, it is rather difficult to understand why the share of grants of the ICAR institutes in respect of ad hoc schemes should be so large. They should ordinarily be covered by their plan and nonplan allocation of funds for research. No problem of importance should ordinarily be missed which would need to be financed separately from *ad hoc* grants. One or two cases of exigency may arise due to inadvertence but not deserving of massive grants as are being sanctioned. The granting of *ad hoc* schemes to ICAR institutes should be discouraged. The money available for *ad hoc* research schemes should be more and more diverted to universities and other research institutes wanting in research grants.

Publications

52.4.18 The ICAR publishes books, technical bulletins, reports and proceedings of important seminars and symposia both in English and Hindi. The number of publications issued by ICAR during the four years 1971-72 to 1974-75 is shown in Table 52.2.

Table 52.2

Number of Publications of Different Categories

categories	1971-72	1972-73	1973-74	1974-75
books	11	5	2	3
technical bulletins	12	3	5	8
reports and proceedings	7	11	1	4
miscellaneous	11	-	11	5
hindi and other languages	8	7	6	5
folders etc.	-	4	6	-

Inspite of the languishing trend in the number of publications in each category which is clearly noticeable, the publications are undoubtedly of great informational value, some of them being topical, the rest more permanent. Obviously, the publication efforts are in response to one of the objectives of the ICAR, namely, "To act as a clearing house of information not only in regard to research but also in regard to agricultural and veterinary matters generally". The ICAR publications have in general the stamp of quality. However, a fresh and critical examination of matters connected with publications is urgently called for. Much more imagination and drive would be necessary to give proper shape to this important objective of the ICAR.

Coordinated Projects

52.4.19 We stated in our Interim Report on Organisational Aspects of All-India Coordinated Research Projects*, "Coordination amongst research scientists working on related

---

* Hereafter referred to as Interim Report on AICRP

problems, whether belonging to the same or different disciplines, is regarded by the Commission as essential for a quick transference of the results of research to the field. In this overall coordination, the All-India Coordinated research Projects occupy an important position". All-India coordinated research projects (AICRP) were well conceived by the ICAR as early as 1957. Their later formulations stem from the success achieved with the Coordinated Maize Breeding Scheme. Systematic efforts were put in around 1965 and in course of 2 to 3 years as many as seventy AICRPs were launched, accounting for 40 per cent of the total outlay for agricultural research in the Fourth Five Year Plan. On the basis of the first hand experience which we gained about the performance of some of the AICRPs in course of our visits to the agricultural research institutes and universities a study was undertaken by us of the then existing AICRPs numbering 70 and an Interim Report on AICRPs was submitted in February, 1973, highlighting the lacunae and the steps required to remedy them. We pointed out that some of the projects did not qualify for inclusion in the AICRPs, and hence a reexamination was suggested. We understand that as a result of the review made, the coordinating units of most of the All India coordinated research projects have now been delinked from the research institutes and centered at the agricultural universities. There has also been a reduction in the number of such projects as may be seen

from the statement below: (vide also Appendix 52.1).

	crops	soils	agro-nomy	Agri-cultu-ral engin-eering	Animal science	Fishery	Total
Fourth Plan	24	6	5	4	25	6	70
Fifth Plan	23	4	6	4	9	5	51

We consider it worthwhile to reiterate the issues raised in the Interim Report and the recommendations made therein.

52.4.20 The concepts on which the AICRPs are based are according to the ICAR as follows:

(i) problem oriented, coordinated research programme;

(ii) intensification of research at selected centres for tackling important problems to support the new strategy of agriculture; and

(iii) strengthening of research where some leadership and the desired facilities are available.

The ICAR recognised that ad hoc research schemes in an isolated and uncoordinated manner were unable to cope with the research needs of the country as a whole. It, therefore, adopted the policy of sponsoring coordinated research projects on an all-India basis. These projects were given full financial assistance in respect of additional staff, contigencies and essential equipment but now only 75 per cent; the rest is to be provided by the State Governments. The broad outlines of the projects are usually chalked out by the ICAR or the central institutes but the detailed technical programme of work is drawn by the participating scientists in course of workshop meetings arranged for the purpose. In locating the centres, the ICAR has to satisfy itself

that they have the necessary physical facilities and high level technical competence required of the staff for the proper functioning of the projects. Each project has provision for a full-time project coordinator for some centres or subcentres. Two other important features characterise the AICRPs viz., (a) the centres and subcentres are to be chosen on agro-climatic basis, so that the results of research become applicable to the different agro-climatic regions of the country as a whole and (b) the research approach must be multidisciplinary, and as such a group of scientists belonging to all the disciplines relevant to a project have to work as a team. Some of the defects which plagued these projects were enumerated in the Interim Report on AICRP, from which we would like to summarise our findings in this regard; these findings hold good even now.

52.4.21 Generally speaking, the research workers in the coordinated projects are oblivious of the research work being done elsewhere in the country. They consider themselves in a different class in view of separate funding of their projects and higher scales of pay, etc. from those in the institutes in which the projects are located. The institute specialists at the same time show little interest in the project work, As a result, a dichotomy is noticed which has undesirable effects on the relationship between the researchers in the projects and those in the institutes.

52.4.22 Some of the research projects have turned out to be mere data collecting units in a routine manner to the deteriment of their research contents. This

has created a sense of frustration in active researchers who have lost interest and initiative in their work. The real purpose of coordinated projects in group thinking and collaboration has thereby been lost sight of.

52.4.23 Instances have been reported in which the advent of a coordinated research project in an institution or a university has led to the closure of research work on that or a similar line being carried out there. This is the result of either research workers of the institution being lured to the coordinated projects of the authorities of the institution withdrawing financial assistance on the plea of duplication of work. It is forgotton that the coordinated projects are meant to supplement and not supplant research resources of the institution. But what takes place in practice defeats the very purpose of the projects. This situation has a far more harmful effect in that the institutes having coordinated projects take no more interest in local problems connected with the particular topic of the project.

52.4.24 Because of certain advantages obtainable in coordinated projects there is a tendency to bring every research scheme within its purview, even though it does not satisfy the normal criteria, by linking other disciplines and agro-climatic centres. This has regrettably given rise to many unworthy coordinated projects and has considerably diluted their importance and diverted their goals.

52.4.25 The undue concentration of coordinated projects in the ICAR institutes like the IARI and the IVRI is another undesirable feature and could have been avoided. We have been told that in spite of many of the coordinators not getting

suitable laboratory space for their work, there is considerable overcrowding at the IARI. The desire to be close to the IARI and the ICAR is understandable but should give place to the fulfilment of the objectives of the projects.

52.4.26 We have briefly referred to the isolation of the project staff from the general stream of researches at the implementation stage. We find that this attitude of isolation prevails also at the formulation stage. The forum of workshops where detailed project planning takes place is often denied to the university researchers and farmers and end users of research results, and to any one outside of the workshops.

52.4.27 Factors such as delays in recruitment, frequent changes in specialists because of the temporary nature of the projects, project coordinators having no hand in the selection of staff and being under the administrative control of the head of the institution in which the project is located, absence of adequate financial powers, having to handle too much accounting work, financial constraints etc. are reported to act adversely on the progress of coordinated projects.

52.4.28 With the gradual expansion of coordinated projects the *ad hoc* research schemes granted by the ICAR out of cess funds to universities and individual scientists have been fewer. As a result, the research activities in universities which are unable to finance from their own resources are on a low key. In spite of the increasing importance of coordinated projects the *ad hoc* research schemes coming especially from the universities should be liberally funded.

52.4.29 On the basis of the background of the existing status of AICRP briefly recounted above, and of discussions with project coordinators and other scientists we suggested a number of improvements in the outlook and the organisation of these projects in our Interim Report on AICRP. We are of the view that those suggestions and recommendations still hold good. The relevant portions (paragraphs 4.2 - 4.21) of the Interim Report on AICRP are, therefore, reproduced here.

52.4.30 "Coordinated programmes on research problems of both fundamental and applied nature in agriculture which are important from the national point of view should be sponsored by the ICAR. These programmes should be drawn up carefully, after a review of the present status of research in that particular branch or field and the gaps that need to be filled in. These could be of long-term or short-term nature depending on the nature of the problem to be studied and the expected time that would be taken for obtaining the results. These programmes should be divided between the Agricultural Universities and the Central Institutes, depending on the nature of the problems to be studied. Thereafter, concrete proposals should be invited from the Universities and other Research Institutes, Central and State, in the respective branches or fields. These programmes should be funded by the ICAR wherever necessary. For this purpose, the ICAR might set up small Teams which could visit each University or the Research Institute, make an assessment of the research that is being done by the scientists in the Institution, the scope and the need for further work, extent to which the programmes could be funded by the University or the State Government or

the Institution and the need for additional funds to be made available by the ICAR. The funds to be given to the Universities should be by way of Block Grants in order to develop a strong base for fundamental and applied research in the Universities. In making the assessment, the ICAR Teams should take into account the types of coordinated programmes envisaged above. An integrated view of the different disciplines, soil type and crops should be taken and then the scope for the participation of the staff in the agricultural university should be examined. In this examination the Coordinated Projects that will continue to be financed by the ICAR have also to be borne in mind.

52.4.31 "There are some problems of national importance which could be handled under the All-India coordinated research projects with advantage. There are problems in the fields of crop production, animal husbandry, fishery and forestry, requiring the research findings to be applied to a variety of field situations throughout the country with the objective of obtaining quick solutions to the problems of all-India importance which are holding up progress. The lack of contact with the general stream of research is less serious in such cases. We, therefore, recommend that the All-India coordinated research projects should broadly satisfy the following criteria:

i) the projects should envisage problem-oriented applied research of known knowledge under different broad agroclimatic conditions with marginal short-term basic research;

ii) the problems to be studied should be of national importance and they may belong to a single discipline or may be multi-disciplinary;

iii) the problems should be such as to warrant the concentration of efforts of a number of scientists on a single problem; and

iv) the Projects should aim at developing recommendations in the shortest time for increasing production.

The ICAR should review the existing All-India coordinated research projects in the light of these criteria and restrict the Projects to those which satisfy the criteria listed above. New All-India coordinated research projects should be sanctioned only when all the criteria are satisfied.

52.4.32 "The replies to the Questionnaire issued by the Commission also indicate that the multi-disciplinary approach should be built into all the research programmes but it is not necessary that all research problems requiring multi-disciplinary approach should be covered under Coordinated Research Projects. In cases, where it is necessary to carry on the relevant research at more than one Centre, a coordinated programme, with appropriate arrangements for funds and coordination should be developed without the necessity of having a Coordinated Research Project.

52.4.33 "The Commission has given careful thought to the problems of coordination of research programmes outside the Coordinated Projects, undertaken by the Agricultural Universities and the Central Institutes. Ordinarily, it may not be necessary to set up a separate organisation for coordinating such research. It should be possible for the scientists concerned to come together and draw up integrated programmes suitably distributing amongst themselves different aspects of the work. ICAR may also help to locate scientists working on related topics and bring them together for

coordination of their research activities. Further, the scientists in the field should be knowing what other scientists in the same sphere are doing elsewhere. The problem, therefore, reduces to one of exchange of information which would pave the way for coordination. Another aim of coordination may be to avoid duplication of efforts, although duplication in scientific research is sometimes necessary. The best way of coordinating the research work of scientists under these varied circumstances should be evolved by the scientists themselves. Where it is necessary to have technical strengthening and financial support for coordination, the ICAR should provide them. There may be many types of coordination. The ICAR should lay down the type of coordination suitable to the particular programme under various schemes financed by it. All research work of local importance should be carried out by the Agricultural Universities and the State Departments through their own organisations and there may be no need for making any institutional arrangements by the ICAR for coordination of such research work.

52.4.34 "In addition to the Coordinated Programmes and the Coordinated Projects, the ICAR should streamline its procedures for financing, on an *ad hoc* basis, individual schemes submitted by scientists which are considered important. At present, such schemes are financed from the cess funds. Firstly, the funds available from the cess for financing of such *ad hoc* schemes are inadequate and, secondly, the procedure involved for obtaining sanction is quite laborious and time-consuming. It is necessary to devise procedures by which this delay is

reduced considerably. Where appropriate, steps should also be taken to obtain suitable schemes, identified by the Scientific Panels, for implementation by research workers. If this is done, there will be a case to place additional funds at the disposal of the ICAR.

52.4.35 "It is stated in the earlier section that in some cases, wherever Coordinated Research Centres have come up existing State/University Research Centres have been closed down. There is a general feeling that this tendency has to be discouraged. It is also reported that because of this some other parallel research work which was being done in the Agricultural Universities is not undertaken now. This has to be deprecated. An important objective of these Projects being to provide additionality and not to replace the research efforts already in hand, it is reiterated that State Governments should not reduce the allocations for research in their development plans.

52.4.36 "A distinction has to be made between a programme and a project. For instance, wheat improvement constitutes a programme while wheat breeding will be a project under this programme. Moreover, project is a facet of the programme which is time-bound and also objective-bound. Further, under the Coordinated Projects there is no clear distinction in the categories of research conducted. In the case of crops, it is reported that some of the Coordinators are engaged in all the three categories of research, namely, basic, applied and adaptive. We would reiterate that only the problem-oriented applied research of known knowledge along with marginal short-term basic research should be conducted under

these projects. In other words, a very large part of the research work in agriculture should be conducted outside the purview of the Coordinated Projects under the coordinated and individual programmes.

52.4.37 "Annual and periodical workshops are being organised for reviewing the progress of work in the project and for chalking out the programme for the next year. At present a large number of workshops are being held and in some of the workshops the number of participants is at times too large. In consequence, deliberations in such workshops tend to become of a general nature and in-depth examination of the problems becomes difficult. There is also a feeling that the workshop has become merely a ritual. In order to have meaningful discussions at these workshops, the number of invitees, in our view, should be limited to those who are directly involved in the programme and a few other experts whose views and guidance may be beneficial. We recommend that the number of workshops should be reduced by suitably grouping together those of allied disciplines. In case of crops like rice, oilseeds, pulses, etc., which are grown under diverse agroclimatic conditions, it would be appropriate to have zonal workshops. These zonal workshops should have more frequent meetings whereas the national workshops might meet once in two years. In regard to the participation of working scientists and other research workers from the Agricultural Universities and State research institutions, we recommend that in view of the financial constraints of the ICAR, already referred to earlier, Agricultural Universities and State Governments should provide adequate funds for meeting

their travelling and other expenses.

52.4.38 "As the workshop is the forum to consider various problems arising from the researches carried out under the project, and as field acceptability is of great importance in this system of research, it would be desirable to associate the farmers, extension personnel, users and the industry also in the deliberations of the workshop as suitable intervals so as to get a feel of the field problems. However, it is expected that the research workers themselves should go out and have discussions with farmers in the local areas, as such frequent dialogues with farmers would help in identifying their problems.

Location of Projects

52.4.39 "A number of Coordinated Research Projects have their headquarters at the Central Institutes. It was explained to the Commission that this procedure was adopted as facilities for organising the Research Projects were readily available at the Central Institutes, and that, but for the cooperation of the Institutes in housing so many of the Coordination Units, these Projects would have never been initiated during the Fourth Plan. It was also stated that compulsion of circumstances rather than desire to locate them at the ICAR Institutes was the main factor underlying the present distribution of the headquarters of these Projects. In this connection, a number of suggestions have been made in response to the questionnaire issued by the Commission. These are as under:

i) the headquarters should represent the most important area with maximum scope for improvement;

ii) it should have a good research environment;

iii) it should have relationship to the importance of the problem germane to the agro-economy of the area;

iv) it should have adequate administrative support and physical facilities of laboratory, field etc; and

v) it should have some relationship with the location of trade and industry concerning the specific projects, e.g., tobacco.

We recommend that keeping these suggestions in mind, the headquarters of the All-India Coordinated Research Projects should be reviewed and the locations should, if necessary, be accordingly shifted. In doing so, a favourable geographical distribution has to be ensured, provided that not more than two or three Projects, have the headquarters located at the same place. It is noticed that there are very few Coordinated Research Projects located at the Agricultural Universities. It is primarily due to the fact that land and buildings are in most cases not available to house these projects. We recommend that these Projects should include a provision of non-recurring grant for construction of glass houses, laboratory facilities etc. This would enable loacting the Coordinated Projects at the different Universities, decided in the light of the criteria indicated above."

52.4.40 "A number of Centres and Sub-Centres have been set up in different States under the Coordinated Projects. Replies received to the Questionnaire support the view that there is great scope for improvement in this direction. The following criteria for selection of locations for Coordinated Projects Centres have been proposed:

i) importance of a crop or livestock species in the region and specific problems therein;

ii) existence of Central Research Institute/Agricultural University/Experimental Stations;

iii) quality of research staff already available in the Institute/University/Experimental Station, etc. and availability of contact with high-level scientists in various disciplines; and

iv) availability of facilities (land, irrigation, library, laboratory etc.) at the Institute/University/Experimental Stations, etc.

In the Commission's view, the most important criterion is the first one. In taking decisions on the actual location of the Centres, however, the other criteria may also be kept in mind. Thus, if a Centre is located at the most important place and if at the location, adequate facilities are not available, it should be possible to augment them under the Project.

Administrative Matters

52.4.41 "We recommend that the Project Coordinator should be a highly competent scientist in the field, possessing qualities of leadership. Mere length of service should not be the criterion for his selection; instead, the quality of his performance as also the capacity to coordinate the work of fellow scientists should be major criteria. If he is on deputation from any of the Universities or Research Institutes, all the requisite facilities of lien, deputation, etc. should be given to attract him to the post of Coordinator. In order to enable him to keep in touch with developments in research, the Project Coordinator may be allowed to undertake research on his own, and for this purpose, senior research fellows may be attached to him.

52.4.42 "A suggestion has been made that insofar as the post of Project Coordinator is concerned, other scientists in the Project should be allowed to hold it by rotation. It is felt that it would be possible only in a Coordinated Programme and not the Coordinated Project. Such a rotation would be feasible in case of Zonal Coordinators. At the same time, we recommend that this may be tried in one or two Projects, on a trial basis and, if found successful be extended to other Projects of long duration.

52.4.43 "The technical staff in the Projects should be on the cadre of the University/Institute. Also, interests of the staff recruited for the Project in the matter of lien, deputation etc. should be safeguarded to the maximum extent possible. It is not necessary that the leader of the team, say, at a crop Research Centre/Sub-Centre under the Project should always be a plant breeder. Specialists in other disciplines may also be appointed as leader where circumstances warrant such leadership.

52.4.44 "In regard to implementation, we recommend there should be continuous and rigorous assessment of each Project. For this purpose, ICAR should develop a system of regular progress reporting on a quarterly basis. The progress reports should be scrutinised by the Project Coordinator. Unless the Coordinator certifies that the work is satisfactory, release of funds should not be made to that Project. We would further recommend that there should be not only a regular financial audit, but also performance audit of each Project, at regular intervals.

52.4.45 "There are other difficulties relating to the inadequate budget for contingencies or for expenditure on maintenance of vehicles, equipment, etc. These have to be overcome for successful implementation of the Project. We recommend that there should be a suitable system of adjustment through which savings on particular Project Centres or Sub-Centres could be allowed to be utilised for other Projects where progress has been quite significant. We also recommend that foreign exchange needed for the import of essential equipment and livestock for various Projects should be ensured.

52.4.46 "It is noticed that the procedures for sanctioning of Coordinated Research Projects have been quite complex. It is also reported that even after the Project is sanctioned by the Indian Council of Agricultural Research, it cannot start functioning unless the State Government/Agricultural University also sanctions the Centre/Sub-Centre and the connected expenditure. It appears that there are delays in these sanctions at the level of State Department/Agricultural University which stand in the way of speedy recruitment of staff etc. needed for effective implementation of the Project. We, therefore, recommend that simpler and speedier procedures should be evolved for the sanctioning of the Projects especially at the State Department/Agricultural University level. Further, it is also noticed that funds allocated for some of these Projects in the Annual Plans are not utilised in full. This necessitates some flexibility in the allocation of funds. There should also be a small grant at the disposal of the Project Coordinator which could

be utilised for unforeseen items of expenditure.

52.4.47 "The problem of coordination between various Projects has been highlighted. We recommend that urgent steps should be taken by the ICAR to overcome this problem. For instance, a joint workshop should be organized for such Projects which are interlinked with one another. Further, the Unit of the Project Coordinator should be a part and parcel of the Institute/University where it is located, so that there is mutual exchange of ideas, proper contacts and regular flow of information between the Project Coordinator and the Specialists at the Institute/University in the working of the Project. Similar exchange of idea, contacts and flow of information should be encouraged between the workers under the Coordinated Projects and outside the Coordinated Projects to ensure effective symbiosis.

52.4.48 "Apart from the problems of Coordinated Programmes and Coordinated Projects, there is one other issue on which the Commission would like to express its views at this stage. This relates to large scale testing of technology. It has been noticed that even after the research results are available, there is often need for testing a new technology on a large scale. The knowledge of inputs needed for such large Projects are of a demanding nature and the economics of the results of research under actual field conditions will have to be tested before they are adopted in the field. For example, integrated watershed management of black soils, reclamation of saline and alkaline soils, performance of crossbred animals, composite fish farming - all these could be tried on an area basis. The primary purpose

of such testing would be to identify the operational problems of the transfer of technology under a given socio-economic milieu. This kind of testing involves, in addition, the participation of competent agricultural economists and rural sociologists in its formulation as well as implementation. In this way, the cost-benefit relationship of the technology can be worked out in detail. This could also form the basis both for Government decisions and for credit agencies to select creditworthy projects. Such large scale testing in our view forms part of applied research, and we, therefore, recommend that this should be taken up by the Agricultural Universities, Central Research Institutes on suitable problems of relevance to the areas in which they are located, in close coordination and collaboration with the development agencies.

52.4.49 "Coordination amongst research scientists working on related problems, whether belonging to the same or different disciplines, is regarded by the Commission as essential for a quick transference of the results of research to the field. In this overall coordination, the All-India Coordinated Projects occupy an important position. These Projects should have, however, well-defined criteria and objectives, as are laid down in this Report (Paragraph 4.3). In view of the criteria that the Coordinated Research Projects are to be formulated on the basis of known knowledge, a considerable part of research will have to be done outside these Projects, for which the Agricultural Universities and the Central and the State Research Institutes have to be suitably supported financially by the ICAR. The Commission has already, in its Interim Report on Some Aspects of

Agricultural Research, Extension and Training, recommended creation by the ICAR of a few Chairs of Excellence for attracting the outstanding scientists. Coordination of research efforts may also originate from the scientists themselves in the form of coordinated programmes as distinct from the All-India Coordinated Projects. Alternatively, the ICAR may locate a group of scientists working in different laboratories on nearly the same problem or different aspects of the same problem, and find it worthwhile to bring the scientists together under a Coordinated Programme of research and give, if necessary, appropriate financial and other assistance. The ICAR may also invite assistance of research scientists of the appropriate disciplines for formulating and implementing a coordinated research programme on problems identified by it as of sufficient interest to the country as a whole. The financing of this programme should be the responsibility of the ICAR itself. There will still be scope for financing ad hoc research schemes of merit of a basic as well as applied nature submitted by individual scientists working in the Agricultural Universities/ Central Research Institutes. Funding and execution of research problems which are strictly of a local nature should be the responsibility of the agricultural universities and State Governments".

52.4.50 The list given in Appendix 52.2 shows that the ICAR till now administers and finances 28 research institutes; two more are being contemplated in the Fifth Plan. Nine of the institutes are concered with specific crops, three with animal sciences, two with fishery and three with soils; five are of general type; four are interested in crop (3) and fish (1) technology and one each in agricultural statistics and agricultural engineering. The dates of establishment of the institutes and the abbreviations used to designate them are given in the list itself against each institute. Some of the institutes inherit glorious traditions insofar as their contributions in the scientific field are concerned. It cannot be said with full conviction that they have been maintaining those traditions. Nor can we say that the more recent institutes have made as significant a mark as some of the old ones did in regard to the quality of their scientific contributions and dedicated pursuit of knowledge. There is, however, no denying the fact that the tempo of scientific activity throughout the country is high, and the total scientific output is by comparison enormous. Even then, our apprehension has been that everything is not well with the research institutes, and a thorough and deep probe is called for. With the specific purpose of obtaining first hand knowledge about the working of the institutes, conditions of research and research workers prevailing in the research institutes under the control of the ICAR we visited 19 of them. We sent to each of them a set of questionnaire having an accent on agricultural research and its organisational aspects. We discussed at great length each

and every one of the items of the questionnaire with the Directors, Heads of Division, research scientists of all categories, students, technicians, research assistants and persons seeking interview individually. At the end of our visits we were convinced that a fresh look is needed in the matter of organisation of research not only in the institutes but also in the ICAR itself.

Scientific Activities and Contributions

52.4.51 Within the scope of this chapter, to make a fair estimate of the significant scientific contributions of the research institutes from the beginning to date is a difficult task. However, some idea may be obtained from published accounts and achievement audit committees' reports, where available, which highlight the scientific achievements of the laboratories. A selection has been made out of the listed contributions which were made available to us and briefly presented below:

(i) The Indian Veterinary Research Institute (IVRI) can be proud of its brilliant research work leading to the development of goat tissue vaccine for rinderpest, and Ranikhet disease vaccine. Its research and developmental work on artificial insemination has been the harbinger of artificial breeding in this country. The traditions laid down by this institute in veterinary research are of high quality. It initiated excellent researches in the field of animal sciences, genetics, nutrition, physiology, climatology and poultry science. Manufacture of reliable biological products of the highest quality, used to cure animal diseases is excellently organised in the institute. It is a pioneer in the field of veterinary and animal science.

(ii) The Indian Agricultural Research Institute (IARI) has a long record of achievements particularly in the field of plant breeding, soil science, pests and diseases. In recent years its

contributions in the evolution of improved varieties of wheat, hybrid maize, hybrid sorghum and techniques of water management and multiple cropping are pioneering. Its training programmes have earned reputation throughout the country. The researches initiated in this institute on sugarcane, tobacco, potato, dairy and lac ultimately led to the establishment of fulfledged institutes in various parts of the country. Work on newer and more improved varieties of crops of varied kinds together with agronomy, pest and disease problems etc. occupies a prominent place in the research programmes of the institute.

(iii) The Sugarcane Breeding Institute (SBI) had a small beginning but an outstanding history. The 'Co' varieties of sugarcane which were evolved here are known throughout the world. They constitute a landmark in the history of research on sugarcane breeding in this country.

(iv) The Jute Technological Research Laboratory (JTRL) is concerned with the physical and chemical properties of jute and other fibres including their processing and spinning. Its contributions in the development of quality fibres and diversified products based on them have drawn consideration attention of industrialists.

(v) The Indian Lac Research Institute (ILRI) is primarily interested in the production of lac and finding diversified uses of it in industry. Its researches on production of seed lac of improved quality, on alternative host tree, development of heat and waterproof polish from lac, shellac-rubber combinations etc. are well known. Lac-coated urea as a slow-acting nitrogenous fertiliser is one of its trial products.

(vi) The Central Rice Research Institute (CRRI) has evolved so far nine improved and high yielding varieties of rice of superior qualities, short duration and disease resistant.

(vii) Introduction of carps, induced breeding of carps by pituitary hormone (PH) administration, methods of collection, preservation and standardising of PH, induced breeding of prawn in captivity, frog culture, etc. are some of the more well known contributions of the Central Inland Fisheries Research Institute (CIFRI).

Check Scan Data

(viii) The Central Marine Fisheries Research Institute's (CMFRI) extensive data on crustacean fisheries have brought to light new and productive prawn grounds. Marine fisheries resource survey is one of its important activities. Its studies on primary production centres inthe sea and on marine environment are pioneering in this field.

(ix) Breeding work on coconut and arecanut at Central Plantation Crops Research Institute (CPCRI) has resulted in high yielding varieites. A dwarfing gene in arecanut has been spotted for the first time. The root (wilt) disease of coconut, one of its fell diseases and so far of unknown origin is under active study from various angles.

(x) The Central Tobacco Research Institute (CTRI) is engaged in the breeding of tobacco leading to improved and disease resistant strains. It is engaged in evolving improved techniques for flue-curing.

(xi) Introduction of new and improved varieties of jute and development of suitable agronomic practices for them occupy a large part of the research work of the Jute Agricultural Research Institute (JARI). Work on establishment of potentialities of ramie as a textile fibre and standardisation of sisal cultivation are some of its other important research activities.

(xii) The Central Potato Research Institute's(CPRI) main interest is in thebreeding of disease resistant and high yielding varieties and hybrids of potato. It has developed the 'seed plot technique' to avoid attack of potato by aphids and to produce healthy seeds. A method of screening potato against early blight has also been developed by the Institute.

(xiii) The Indian Institute of Sugarcane Research(IISR) is engaged in improved agronomy of sugarcane and economics of companion cropping with wheat, potato, berseem, etc. It has developed techniques of screening sugarcane against smut, and of moderate heat treatment to kill scale insects and mealy bug. A bullock drawn semi-automatic sugarcane planting machine has been designed and fabricated, which does a number of operations simultaneously.

(xiv) Crossbreeding of Indian cattle with foreign breeds leading to increased milk production is one of the important activities of the National Dairy Research Institute (NDRI). Contributions in the field of chemistry and biochemistry of milk protein have won high recognition. It is also a leading centre of dairy education.

(xv) Started as a Desert Afforestation Research Station, the Central Arid Zone Research Institute (CAZRI) is unique in its programme of research work which deals primarily with agriculture under rigorous constraint of soil moisture and high temperature and consequent desertic condition. Its main interest lies in the evolution of varieties of crops and grasses and trees which would survive such conditions. The major thrust is on plant and animal physiology and agronomy aimed at water economy, geomorphology of deserts, stablisation of sand dunes and solar energy utilisation.

(xvi) The Central Institute of Fisheries Technology (CIFT) has done and is doing very useful research work on fishing gear suitable for different kinds of fishing. The development of designs of trawl nets for increased catch is a significant contribution. The designing of low cost fishing boats using indigenous materials, e.g., timber, coating materials etc. is another important activity of the institute. Researches on processing of fish leading to safe and prolonged preservation, canning, dehydration, utilisation of byproducts have yielded useful results, capable of industrial exploitation.

(xvii) The researches carried out at the Institute of Agricultural Research Statistics (IARS) are mainly directed to methodologies of estimation of crop yield and cost of production/assessment of production programmes, design of experiments and evolving a national index of field experiments.

(xviii) The Central Sheep and Wool Research Institute (CSWRI) is well known for its work on evolving breeds of sheep for fine wool and dual purpose breeds of sheep by crossbreeding. A successful method of carbonisation of Indian wool and development of new varieites of guar and grass for feeding sheep are some of the significant contributions of the institute.

(xix) The Indian Grassland and Fodder Research Institute (IGFRI) is engaged in the screening of a number of fodder crops for high yielding and disease resistant cultivars. It also carries out agronomic experiments with fodder crops leading to suitable packages of practice and crop rotations.

(xx) Breeding high yielding and disease resistant varieties of tuber crops such as cassava, sweet potato, yam is an important research activity of the Central Tuber Crops Research Institute (CTCRI).

This is backed by necessary agronomic studies for optimising yield.

(xxi) The Indian Institute of Horticultural Research (IIHR) has so far introduced a large number of grape varieties, some pineapples, banana, guava and strawberry. Ethrel treatment has been found to induce uniform flowering. New varieties of several vegetables have been developed. A pumpkin variety resistant to fruitfly has been bred for the first time.

(xxii) A satisfactory method of reclaiming saline sodic soils on a large scale by means of gypsum treatment has been developed by the Central Soil Salinity Research Institute (CSSRI) and good yields of paddy, wheat and barley have been obtained.

Classification

52.4.52 From the list appended (Appendix 52.2) of the research institutes under the control of ICAR, it will be seen that they did not come into existence as a result of overall planning. Some were established before the ICAR was formed, some were legacies of the commodity committees, and most of the rest were transferred from the Ministry of Agriculture and Irrigation. Only a few were set up or adopted by the ICAR after its reorganisation. Because of this background it is not easy to subject the data and antecedents regarding the institutes to a meaningful analysis to bring out any pattern of their organisation and development. The data made available to us in reply to our requests by these institutes, are compiled in Table 52.3. It will be seen from the table that the institutes vary widely in the number of research, field and administrative staff, budgetary allocations, annual expenditure for scientific staff and current expenditure per scientific staff. On the basis of these rough estimates the institutes may be classified in several ways, as shown in Tables 52.4 to 52.7).

Table 52.3

Staff and Expenditure Pattern of Research Institutes

Name of the institute	Research staff	Field staff	Administrative staff	Budget (Rs lakhs)	Average rate of increase per yr (Rs lakh)	Annual expenditure per scientist in 1973-74. (Rs thousand)	Average increase per scientist (Rs)
IARI	532	1873	36	451	37	85	6950
IVRI	241	991	294	126	12.8	52.5	5300
NDRI	246	126	159	134	8.5	54.5	3460
CSWRI	52	252	74	26	2	50	3820
CIFRI	323	440	110	43	3	13.3	930
CTCRI	39	51	33	7.4	0.57	19	1456
CSSRI	35	79	32	25	4.4	70	12600
CTRI	97	184	106	24.5	1.7	25.4	1750
CPCRI	80	70	92	29.5	2.7	37	3320
CRRI	156	169	133	45.8	4.3	29.4	2730
CTRL	66	Nil	189	30	2.6	45.5	3920
JARI	68	144	108	27.9	2.3	41	3400
JTRL	36	53	50	14.1	1.0	39.2	2790
ILRI	57	6	94	17.1	1.2	30	2100
SBI	37	Nil	139	13.5	1.0	36.4	2700
IISR	65	29	46	24	3	37	4600
CPRI	114	108	76	53	4.1	47	3600
IARS	182	206 (tech)	159	24.6	1.4	13.4	770
IHR	75	52	33	21.8	1.7	29	2260

Table 52.4

Classification of Research Institutes According to Staff Strength

30-59	60-89	90-119	120-149	150-179	180-209	210 and above
CSWRI	CPCRI	CTRI		CTRI	IARS	CIFRI
CTCRI	CTRL	CPRI				NDRI
CSSRI	JARI					IARI
JTRL	IISR					IVRI
SBI	IHR					
ILRI						

Table 52.5

Classification of Research Institutes According to Annual (average of 6-10 years) Increase in Expenditure per Scientist.

(Rs)

900-1500	1500-2100	2100-2700	2700-3300	3300-3900	above 3900
CIFRI	CTRI		CRRI	CSWRI	
CTCRI	ILRI		JTRL	CSSRI	
			SBI	CPCRI	
				JARI	CTRL
				NDRI	IARI
				CPRI	IISR

Table 52.6

Classification of Research Institutes According to Expenditure in 1973-74 per Scientist

(Rs - thousands)

10-20	20-30	30-40	40-50	50-60	Above 60
CIFRI	CTRI	CPCRI	CSWRI	NDRI	CSSRI
CTCRI	CRRI	JTRL	CTRI		IARI
	ILRI	SBI	JARI		
		IISR	CPRI		

Table 52.7

Clssification of Research Institutes according to Ratio of F/S and $\frac{F+A}{S}$

F/S								$\frac{F+A}{S}$
0.1-1.0	CPCRI, IISR	ILRI, CPRI	NDRI,	ILRI, CPRI,	CIFRI, CPCRI,	NDRI, CRRI	IISR,	1-2
1.0-1.5	CIFRI, JTRL	CTCRI,	CRRI,	CTCRI,	CRII,	CTRL,	JTRL	2.1-3.1
1.6-2.1 2.2-2.7	CTRI, CSSRI	JARI		CSSRI, CSWRI	JARI,	SBI,	IARI	3.2-4-2 Above 4.2
2.8-3.3								
Above 3.3	IARI, CSWRI							

S - scientific staff

F - field staff

A - administrative staff.

These tables show that whatever parameter one takes considerable differences are noticeable in these institutes but some of them are found to group together, being either too big in staff and financial resources or too small. Some differentiations were intentionally introduced by the epithets 'Indian', 'National', 'Central' or by their absence. Three of the institutes were agreed in principle to be declared as 'National', and one of those three being again recognised as a 'deemed' university by the University Grants Commission. It is observed that unhealthy competition gets started by each institute to raise its status and widen its scope, not always on rational considerations. Such tendencies have to be deprecated and discouraged.

52.4.53. A statewise distribution of the institutes shown in Table 52.8 shows that there are none in Gujarat, Tripura, Jammu & Kashmir and Punjab. Recently, an ICAR research complex has been set up in Shillong to serve the North Eastern States. An Institute of Agricultural Engineering has been set up recently at Bhopal. The location of research institutes is governed by such factors as favourable agroclimatic conditions, easy availability of resources - natural as well as man-made. In order that the results of research are applicable elsewhere, the conditions at the location should as far as possible be representative of those in several other places. It is, therefore, to be expected that the impact of research results, if there is any, should be evident at least in the region close to the institutes and in other regions placed in similar conditions in regard to application of results of research. This is all

the more expected in view of the widely publicised field days which are held annually for the benefit of the neighbouring farmers. The figures given in Table 52.9 of production and productivity growth rates are those of commodities in the States or in the regions in which the ICAR institutes were set up. Unexpectedly growth rates show declining trends.

Table 52.8
Distribution of ICAR Research Institutes in the States

States	Research institutes
Andhra Pradesh	CTRI
Maharashtra	CTRL, AISLUS
Bihar	ILRI
Haryana	NDRI, CSSRI
Himachal Pradesh	CPRI
Karnataka	IIHR
Kerala	CPCRI, CTCRI, CMFRS, CIFT
Orissa	CRRI
Rajasthan	CAZRI, CSWRI
Uttar Pradesh	IISR, IVRI, IGFRI, CSWCRTI, VL
Tamil Nadu	SBI
West Bengal	JTRL, JARI, CIFRI
Delhi	IARI, IARS
Meghalaya	ICAR research complex

Table 52.9

Area, Production and Yield of Some Commodities

A - Area - '000 ha
P - Production - 000' tonnes
Y - Yield per hectare - kg

	Cuttack			Balasore			Dhenkanal		
	A	P	Y	A	P	Y	A	P	Y
rice									
1960-61	421	432	1.02	392	341	0.87	259	283	1.09
1961-62	477	437	0.92	331	290	0.88	322	342	1.06
1962-63	608	522	0.86	433	287	0.66	310	246	0.79
average			0.93			0.80			0.98
1970-71	583	470	0.81	409	389	0.95	249	312	1.25
1971-72	602	309	0.49	464	214	0.46	315	225	0.71
1972-73	660	634	0.96	395	335	0.86	315	294	0.93
average			0.75			0.75			0.97
	Coimbatore			Lucknow			Hordoi		
sugarcane									
1960-61	1.7	17.5	10.0	2.2	8.0	3.6	21	74	3.6
1961-62	1.8	17.9	9.6	2.4	7.9	3.4	24	81	3.4
1962-63	1.5	15.5	10.2	2.1	6.1	2.9	24	69	2.9
average			9.9			3.3			3.3
1970-71	28	243	8.7	2.7	9.7	3.6	22	89	4.1
1971-72	25	232	9.3	2.4	8.1	3.3	18	64	3.5
1972-73	25	227	9.1	2.3	7.7	3.3	23	78	3.4
average			9.0			3.4			3.7
	Simla			Farrukhabad			Jullundur		
potato									
1960-61	0.26	1.5	5.8	13	99	7.5	2.3	41	18
1961-62	0.32	1.8	5.7	13	74	5.7	2.7	38	14
1962-63	0.31	2.2	7.1	13	91	6.9	3.7	69	18
average			6.2			6.7			17
1970-71	0.33	1.8	5.6	23	215	9.4	2.4	36	15
1971-72	0.28	1.7	5.9	24	227	9.6	2.6	39	15
1972-73	8.30	41.3	4.9	24	233	9.5	6.5	97	15
average			5.5			9.5			15

	Guntur		
	A	P	Y
tobacco			
1960-61	81	67	0.82
1961-62	96	79	0.82
1962-63	98	82	0.84
average			0.83
1970-71	39	20	0.52
1971-72	37	29	0.78
1972-73	35	20	0.59
average			0.63

52.4.54 The research institutes belong to various categories, some having broad objectives drawn on a wide canvas, others having narrower objectives. Institutes devoted to a single crop, species or commodity, covering various aspects of the same species have been established, e.g., rice, cotton, jute, sugarcane, tuber crops, tobacco, sheep, fruits, grass and fodder, lac, etc. Some of the above species are again the subjects of coordinated research projects. On the other hand, there are some like wheat, jowar, bajra, maize, barley, pulses, oilseeds, cattle, poultry, etc. for which there are no specific research institutes as such, but they are no doubt covered by coordinated research projects and by projects of agricultural universities and of general agricultural research institutes.

52.4.55 One of the important purposes of doing research, particularly applied research, is to increase production and productivity. Data on growth rates similar to those in Table 52.10 given at the end of this paragraph have been obtained in respect of a number of crops which fall into the two groups as mentioned above according as they are specifically covered by some research institutes and organisations or not. Amongst the crops included in the first group none except coffee and tea show any marked growth rates either in production or in productivity. Out of those in the second group bajra, maize and wheat show high growth rates. The most remarkable example is that of wheat which shows high growth rates in production, area and productivity. Bajra, in spite of low area coverage, shows high production

because of high productivity. In maize, the situation is the reverse of that of bajra. None of these three crops are specifically studied by any particularl institute, but their impacts are definitely higher than those crops which receive special attention. In tea and coffee which are cash crops and foreign exchange earners, evidently special efforts are made to bring research and extension to bear on production and productivity. In those crops where research attention is particularly being bestowed upon by a large number of competent scientists, working in well equipped laboratories, the absence of the expected impact of science and technology on production and productivity needs thorough probing. Three reasons may be ventured:

i) the research recommendations are valid and effective but not extended throughout, the regions where they would be applicable;

ii) the research recommendations are valid and effective in a broad sense but are not adapted to the regions concerned through the necessary adaptive research; and

iii, the research recommendations are not valid and effective and hence not acceptable to the farmers.

It is necessary to know which of the above is correct or whether there are other reasons.

Table 52.10

Rates of Growth in Production (P), Area (A) and Yield/ha (Y) during 1960-61 to 1972-73

Crops for which research institutes exist

	P	A	Y
rice	1.68	0.63	0.97
cotton	0.76	-0.33	0.99
jute	-0.81	-0.96	0.16
sugarcane	1.65	0.50	1.10
coffee	5.63	1.81	3.90
tea	2.70	1.15	1.38
tobacco	1.39	0.82	0.51

Crops for which no specific research institutes exist

	P	A	Y
jowar	-1.50	-0.94	-0.76
bajra	4.83	0.86	3.99
maize	4.06	3.08	0.75
ragi	0.29	-0.54	0.83
wheat	12.42	4.31	5.86
barley	-0.34	-1.69	1.73
cereals	2.99	0.84	1.90
gram	-1.45	-2.23	0.85
pulses	-0.97	-1.15	0.24
groundnut	0.44	0.44	-0.02
sesamum	1.10	0.09	1.00
rapeseed and mustard	3.36	1.25	2.46

52.4.56 Assuming that the spread of the high yielding varieties contributes to increase in production and productivity and assuming that the high yielding varieties started their victorious journey not before 1966-67, some broad relationship was sought of the increase in areas covered by some high yielding varieties with the total production of those crops during the period 1969-70 to 1972-73. The effects of weather and inputs have not been specifically accounted for. Inputs in the form of seeds, fertilisers and plant protection chemicals show increasing consumption. Effects of bad and good weather may be considered to have

cancelled each other. Moreover, an overall increase in irrigations has been recorded implying that water is not possibly the limiting factor. The figures given in table 52.11 reveal that in spite of increased area coverage by the high yielding varieties, paddy, jowar and bajra did not show increase in production and productivity, rather the reverse; whereas both wheat and maize do show the expected increases in both with increased coverage by the high yielding varieties.

Table 52.11
Area Increases, Production and Yield of Improved Varieties of Cereals*

Crop (improved variety)	1969-70 A	1969-70 P	1969-70 Y	1972-73 A	1972-73 P	1972-73 Y	A69/ A72	P69/ P72	Y69/ Y72
paddy	11.5	40.4	1073	24.0	38.6	1073	2.10	0.95	1.00
wheat	29.6	20.1	1209	51.5	24.9	1254	1.77	1.24	1.04
maize	8.5	5.6	968	8.8	8.8	1084	1.03	1.57	1.12
jowar	2.7	9.7	522	6.1	6.4	435	2.23	0.66	0.84
bajra	9.5	5.3	426	9.7	3.8	324	2.08	0.72	0.76

* A -area increase in million ha; P - production in million tonnes; Y - yield in kg/ha

Species versus **Disciplines**

52.4.57 A scrutiny of the list (Appendix 52.2) of the ICAR institutes shows that except for the IARI, each of the rest more or less restricts its objectives either to one discipline or to one or a group of species, i.e. crops or animals. Insofar as crop sciences are concerned the IARI research efforts are

~~widely spread~~ over ~~almost all~~ crops and all disciplines. We consider that the breaking up of research work into disciplines and species is on the basis of need, convenience and expeditiousness. It is not a question of either discipline or crops or animals but of discipline and crops and animals in a balanced way. In fact, there is no scope for dichotomy in respect of discipline and species, because they are interrelated and can grow together only when suitably balanced. The tendency of establishing divisions on the basis of a discipline and of expanding them by introducing limitless sections or units based on species has to be deprecated and stopped at an appropriate and manageable size of the divisions.

Location of Institutes

52.4.58 The location of a research institute is usually decided, whether based on disciplines or species, by the physical facilities it can muster for the needed research and the contributions it can make towards development of the discipline or species, in the same and similar regions. If based on species, the institute should, therefore, be located in a place representative of the particular agroclimatic condition in which the species would flourish best. Rice serves as a good illustration of this principle, because it is grown under widely varying conditions. In conformity with this principle we suggest that research institutes should spread evenly over the different agroclimatic regions. For this prupose, they should preferably be of small and medium sizes having more specific and restricted objectives, so that manageability and viability are assured. In that case, it would be expedient and economic to pool and share some of the

sophisticated facilities, e.g., of costly instruments and equipment, special laboratory techniques, etc. on a regional basis. The advantages of taking this measure have been elaborated in paragraph 52.4.82 while discussing the plight of such facilities in big institutes. The same idea can be extended to a group of institutes within a region.

Autonomy of Institutes

52.4.59 The Agricultural Research Review Team which recommended the transfer of control of research institutes from the Government to the ICAR categorically stated as follows:-

"It must be emphasised that technical and administrative control of Institutes is not intended to amount to the direction of research in detail. Directors of Research Institutes must be carefully chosen as the best scientist-administrators available, and given the greatest possible degree of autonomy and scope for initiative in the framing and implementation of suitable programmes. The coordinating body must guide rather than direct the Institutes under its control. All the authority possible should, therefore, be delegated by the Council to the Directors".

52.4.60 The Team also recommended that the IARI, IVRI and NDRI are to be recognised as institutes of national importance. The relationship between the headquarters and the institutes was tritely expressed in one sentence, "The headquarters staff is to be the Director-General's staff and not a layer in an administrative hierarchy, superior to the Director and the Heads of Divisions in institutes". The ICAR itself was granted autonomy but the research institutes were denied this privilege. The Achievement Audit Committee

of the IARI in its report in 1972 remarked, "The so-called autonomy was more on paper than in practice". If this is true of the IARI, how much more would it be in the case of the other institutes. The ICAR Enquiry Committee(1973) which went deep into this question writes as follows:

"The Committee has been informed that sometimes, even for routine matters, the Institutes had to look up to the ICAR headquarters. The spirit of a hierarchal setup which the Team (Research Review Team) had tried to discourage has permeated in almost every sphere of the working of the organisation, so much so that it has percolated down to the lowest level of Heads of Divisions. This centralisation of functions has led to considerable dissatisfaction in the minds of scientists". The usual constraints of Government departments arise from such bureaucratic attitude.

52.4.61 We have already pointed out that the ICAR institutes are not only differentiated by such epithets as "National", "Indian", "Central", "Deemed University", etc. but also by the extent of power delegated to the Directors. Even their scales of pay vary. We are of the view that such discriminations and status distinctions are not proper and conducive to the growth of a healthy scientific community. We are strongly of the opinion that posts of Directors of all the ICAR research institutes should carry the same scale of pay. The salary to be paid to a Director should, however, be in accordance with his merits as a scientist, and be fixed by referring the matter to the body appointed to select him, irrespective of the status of the Institute.

Achievement Audit

52.4.62 Evaluation is indispensable for good management. It has been the practice of the ICAR to constitute for each institute under its control an achievement audit committee every five years for the purpose of assessing its performance. The primary aim is to improve the working of the institute on the basis of suggestions and recommendations of the committee. Unless sincerety and seriousness are the keynote of this process, a vicious circle sets in. A serious-minded committee may do a thorough job and recommend certain not-so-difficult-to-implement changes; but for some unknown reasons they remain unheeded until the next committee is appointed. Having seen the fate of earlier recommendations, the second committee may feel disinclined to make any of consequence. In this way, an institution nobly begun with high aims languishes in the course of ten years or so. If the seriousness is wanting in the committee itself, the degeneration comes quickly. The institution of the achievement audit committees hangs between these two extremes because of certain checks and balances. They, therefore, do some positive good. One is the self-assessment and self-searching each scientist has to do at the time of the achievement audit committee's working. There may be a tendency to overdo in order to display his best, but that is for the committee to sort out. We have had an access to a number of reports submitted by such committees in respect of institutes which we also visited. While highlighting the valuable contributions of the research institutes the committees take pains to suggest guidelines for future development and measures for removing the lacunae. It was observed that while some of the institutes genuinely wanted

to implement some of the recommendations which they might have taken pains to convince the committees to make, there are others who care less. In none did the ICAR put its weight to set matters right in the direction of what was good for the institutes. In this way, the whole exercise becomes a futile ritual. To avoid such a situation and for the sake of better management of the institutes, the good institution, of achievement audit should be taken seriously and recommendations made by the Committee be effective instruments of improvement.

Research, Teaching and Extension

52.4.63 The concept of an integrated approach to research, teaching and extension education has been accepted as the keynote of agricultural universities. The controversy and confusion that arose in the interpretation of this concept were discussed at great length in the Interim Report on SAARET and the jurisdictions of the universities and State departments in regard to each of the three functions were clearly spelt out (vide Chapters 6 and 7 of the said Interim Report). No specific mention of the role of the ICAR research institutes in respect of research, teaching/training and extension was, however, made in the Interim Report. While we reiterate the views and recommendations made there as to the respective responsibilities of the agricultural universities and State departments, we have to give our considered opinion about the responsibility and jurisdiction of the ICAR research institutes in the matter of research, teaching/training and extension.

52.4.64 In course of our visits, (vide questionnaire in Appendix 52.3) to the ICAR institutes we noticed the eagerness of some of them to introduce research, teaching and extension in such an organised form that they may apply to University Grants Commission for considering them as 'deemed' universities. This idea stems from the eagerness of every ICAR research institute to copy IARI and to attain a status similar to it. The reasons for assuming formal teaching responsibilities in addition to research on the part of the IARI, IVRI and NDRI are historical. Before the coming into existence of the agricultural universities those institutes consolidated their positions in regard to research, teaching and extension in their own ways. Before the integrated approach to the three was enunciated, the IARI had been granted the authority by the University Grants Commission (UGC) of a 'deemed' university. In the wake of the establishment of agricultural universities the IARI accepted the integrated approach as one of the guiding principles, as it is so with the agricultural universities. It, however, set the pattern, as it were, of other institutes.

52.4.65 A perusal of the activities of the ICAR institutes shows that they are all engaged in some kind of training, diploma and certificate courses. Almost all of them are anxious to have extension units either to contact farmers or industries. Some of the institutes have substations in different places for elaborating and testing research results. Most of them are recognised as centres of research for doctoral work by one university or the other, more than 50 per cent being already engaged in guiding doctoral candidates. A good number of the institutes propose to introduce postgraduate courses. The

trend is clear. All the institutes are eager to convert themselves into degree-awarding academic bodies. It is to be admitted that the M.Sc. and Ph.D or similar degrees are merely to indicate that the candidate possessing them has attained a certain degree of competence in carrying out research work. The degree course should be considered as one of training in research methodology and the candidate may not be expected to make any outstanding contribution. The climate of universities where disciplines of all kinds interact and amalgamate is conducive to such training. Now that agricultural universities have been established in good number, the training courses in research should be centred in the universities only. The present tendency of research institutes to compete with the universities in awarding degrees will defeat the very purpose of the institutes, and should be gradually curbed in the right direction.

52.4.66 Having recognised the need for extension of research results for the benefit of farmers, industries and any other agency willing to take advantage of them, we suggest that each institute should have a liaison unit, not necessarily a division, which would communicate with the extension workers in the area through the State departments and publish such bulletins, booklets etc. as would be required to further the extension work. They may not themselves have anything to do with extension work in the field. However, there should be no difficulty on the part of research workers going out in the field with the extension workers to see for themselves the field performance of their researches and at the same time to glean fresh problems from their

field observations. The institutes should refrain from any enterprise of large scale production and distribution of materials e.g. of seeds (except breeder seeds), fertilisers (including bactorial or algal cultures, biological products) etc. They should restrict themselves to the perfection of products of their research work, allowing outside agencies, preferably trained persons from the institutes/universities to commercialise the products.

52.4.67 We have already indicated in the Interim Report on SAARET the scope and obligations of the universities and State departments in matters pertaining to training. It would be highly desirable if the ICAR research institutes arrange their training programmes in collaboration with the agricultural universities of the States or regions in which the institutes are located. Teachers for a particular course may be selected from both the institutions and the practicals and classes may be arranged jointly, preferably in the case of courses of relatively long duration. If the ICAR research institutes are relieved of some of the responsibilities mentioned above, which they were compelled to accept because of the absence of other agencies and infrastructure in the country, they would be able to devote more seriously and effectively to the basic and applied research work assigned to them. Believing that research responsibilities must be apportioned and coordinated in the manner envisaged by us in the Interim Report on SAARET, we would recommend that the major portion of responsibilities of agricultural education, training and extension education should eventually shift to the universities and State departments.

Future Trends

52.4.68 To our query about the future trends and possibilities the most common and spontaneous reply was one of expansion, whether it was from the head of the institute/division/section or the individual scientists. The tendency to expand rather than consolidate is in vogue. It stems from the dictum that expansion is progress. But one should realise that consolidation is no less a sign of progress, and better than unthoughtful expansion in the name of progress. The possession of more laboratory space, more equipment, more staff of all categories, research scholars and projects is the order of the day and a way of becoming important, also in the name of progress but in complete disregard of the question of competence and manageability. No strings seem to be bad enough to pull to achieve these ends. Some of the big institutes have by this process alone expanded beyond limit, and even then they do not seem to feel satisfied. "ICAR Research Institutes in the Seventies" published by the ICAR in 1972 makes in this context an interesting reading. Each institute is nonspecific in mentioning its future activities but the spirit of expansion permeates throughout. This defect has originated from the behaviour of the big institutes, and should be checked.

52.4.69 Obsolescence in science is quicker now because of rapid growth of knowledge. But we found little of it in most of the institutes which have been adding one division after another without thinking of discarding any. Institute projects running for years on and are extended even though their value and importance are doubtful in the present context. Some of the coordinated projects also belong to this category.

'Critical' Size in Institutes

52.4.70 No fixed pattern of development is noticeable in the ICAR research institutes. Whatever may be the reasons for the lack of pattern, one even casually would notice the differences in financing, staff strength, availability of facilities and resources, location etc. (paragraph 52.4.52). The institutes differ considerably in their scope and objective, and hence in their size. The research setup in those institutes which are based on species assumes a multidisciplinary nature. As already mentioned in the introductory section multidisciplinary research unit is characterised by a 'critical' number of scientists and amount of facilities. Below these critical values research effort is not likely to be viable, and above this limit the unit may be difficult to manage and be in a chaotic condition. One

institute, forexample, has only 3 divisions, and 35 research scientists, whereas another has (Table 52.12) as many as 22 divisions and over 500 research scientists. Between these two extremes lie the remaining institutes. Can the 'criticality' test be applied to these different institutes? In the absence of any idea of the 'critical' size either in terms of number of scientists in an institute, or a division or a section of a division, or in terms of number of divisions in an institute, or of sections in a division, we posed questions to Directors of the research institutes, to Heads of divisions and sections-in-charge to elicit a consensus in regard to the 'critical' size. All of them varied in their estimates, according to their own experience and capability. The Directors were of the view that they can manage well 100 to 300 scientists and 6 to 10 divisions. Heads of divisions suggested that they can manage well 20-40 scientists and 6 to 8 sections, while a sectional Head thought that 4 to 6 scientists in a section formed a viable and manageable unit. These estimates are averages, some Directors and Heads of divisions claimed even higher numbers as manageable. Judged by these yardsticks the ICAR research institutes may be characterised as viable/manageable or not, as shown in Table 52.12.

Table 52.12

Number of Divisions in Research Institutes

Institute	Divisions
IARI	22
IVRI	22
NDRI	7
CRRI	11
CPRI	3
IISR	6
SBI	7
JTRL	5
JARI	8
CTRL	8
CTRI	8
CPCRI	9
CTCRI	5
IHR	9
IGFRI	7
CAZRI	6
CSSRI	4
CSRTI	4
ILRI	5
CIFT	3
CMFRI	3
CSWRI	3
CTRS	9
IARS	5

On the basis of our impressions about the working of the institutes of various sizes and discussions with Directors Heads of divisions and a number of research scientists, we are led to believe that certain limits to the size of institutes should be prescribed. On considerations of viability and manageability, we are of the view that a research institute should not have more than eight divisions each of six sections. Each section should be manned by not more than five researchers, so that the total number of research staff of the institute does not exceed 240. Institutes of smaller sizes are more manageable and should not be allowed to expand beyond the above limits. Larger institutes than those suggested above should be discouraged and the existing ones suitably dispersed if possible or their management decentralised. The obvious conclusion is that those institutes/divisions which are below the 'critical' size should be strengthened and those above should be allowed to be dispersed in the best possible manner, or to redistribute with suitable administrative changes, The example of IARI as an overgrown institute has been amply elaborated by its

Achievement Audit Committee in its report submitted to the ICAR in 1972. The Committee suggested steps to stop further expansion and to redistribute divisions into five wings each of which was to be administered more or less autonomously but in coordination with the other wings. There is an inherent tendency of Directors to establish new divisions, not always out of necessity but out of the feeling that the bigger the institute, the higher its prestige is. On scientific grounds such a notion finds no justification. Following the usual tendency the Heads of divisions and sections plan for the creation of new sections/ units, making it difficult for them to manage and provide necessary facilities owing to financial and other constraints. As a result, standard and quality of research work go down, and frustration sets in amongst the active scientists.

52.4.71 The IVRI which originally started as the Imperial Bacteriological Laboratory has now grown to an institute of unmanageable size, having as many as twentytwo divisions spread over two campuses. We understand a few more divisions have been sanctioned. Our visit to various divisions/sections of the IVRI has convinced us that the institute is now beyond the limit of manageability. It was brought to our notice that this institute services broadly three specialised areas, namely, animal health, animal production and livestock products technology which is as yet to develop, and that it has the strongest base for animal health research encompassing 10 divisions. The animal production component comprises mainly three major divisions viz. those of animal genetics, animal nutrition and poultry research. It appears to us that the two major constraints to any further growth of this Institute are manageability and land

availability. In our opinion its further expansion would adversely affect the growth of the animal health research which needs further strengthening and support in view of the massive livestock development projects being taken up using exotic germ plasm. In Chapter 30 on Sheep and Goats and 33 on Mixed Farming we have already recommended the establishment of an institute on poultry and another on animal nutrition in view of the growing need for research support for these two important industries/disciplines. Further expansion of activities in the field of animal production is essential. The Animal Genetics Division of the IVRI has played a significant role in the formulation of animal improvement programmes and providing the basic background research knowledge. Pioneering research in artificial insemination was carried out in this division which became the main plank for cattle and buffalo development work. Most of the breeding research programmes like those of crossbreeding of cattle, sheep and goats, pigs and other animals originated from this nucleus. During the Fourth Plan this Division was reorganised to provide the basic research support for major livestock breeding projects. In line with this a centre of advanced studies on population genetics has been sanctioned during the Fifth Plan. In order to provide support to the field of basic research in animal breeding, two more divisions, one of animal reproduction and the other of livestock economics and statistics, have been created by the reorganisation of this Division.

52.4.72 Realising the need of developing Animal Genetics in an integrated manner so that it can form the nucleus to provide basic research information and trained manpower to support the large livestock breeding projects, a proposal for setting up an Institute of Animal Genetics was accepted during the Fourth Plan. We are of the view that it is essential to set up an Institute for Animal Genetics and Breeding and we, therefore, recommend its establishment. This institute may also deal with the discipline of animal reproduction.

52.4.73 In our opinion the five research institutes, three proposed and two existing, should be able to cater to the needs of research work in the field of animal sciences. Because of the fear of becoming unwieldy we do not think of amalgamating the three proposed institutes into one. A spreadout of small or medium sized institutes is considered by us to be more effective and useful.

Scientists at Headquarters

52.4.74 We briefly referred to the remark of the ICAR Enquiry Committee (paragraph 52.4.60) in connection with the relationship of the ICAR research institutes with the headquarters. A reference to the staff position at the headquarters mentioned earlier (paragraph 52.4.11) would suggest that the administration at the headquarters is getting more and more heavy at the top and an appreciable number of good scientists are locked up for doing a kind of administration for which their talents should not be wasted. Even with the institutes under the technical control of the ICAR as at present, the Directors of the institutes, if they are allowed the autonomy as envisaged, the headquarters would have very little to

administer. The acceptance of the principle of tenurial assignments of the scientific staff at the ICAR headquarters is in the right direction. We would strongly urge that the principle is rigidly followed, and no one should on any account be allowed to have more than two terms of three years each.

Management

52.4.75 Viability and manageability of research institutes have been considered as the main criteria determining their size. Manageability has several aspects, of which size is the most important. The size range mentioned above arises out of the opinions expressed by Directors of institutes and Heads of divisions, and is definitely related to the capability and confidence of individuals. This capability is enhanced by training and experience. At present there is no institutional arrangement for training in research management as is available in the case of those competing for administrative jobs and forest services. It is envisaged (vide Chapter 62 on Administration) that in due course an Indian Institute for Agricultural Administration and Management would be established where young entrants to the agricultural service would be required to receive training in management. We recommend that similar facilities should be created for management training of personnel engaged in agricultural research and technology. Those already in service may have inservice training and/or special courses according to their experience and length of service. The other elements that go into management of research may be indicated here. Most of the scientists are highly

specialised in particular branches ofscience or technology. As a consequence, they often tend to be oblivious of the importance of other branches, especially if the latter are somewhat remote from their own specialisations. This tendency would be a disqualification in a manager of science, e.g. the Director of an institute or the Head of a division. He must be fully wedded to the objectives of his task and provide drive, guidance and encouragement at the proper time and place even at the risk of sacrificing, if necessary, his own scientific pursuit to some extent. His outlook should be broad enough, so that he can see unbiased the role of disciplines and specialisations other than his own in the fulfilment of the task assigned to him. In the sphere of research management, the scientific calibre of the manager should be of a high order. But that alone is not enough. He has to be close to the scientists and researchers in a personal sense. He should evince critical interest in their scientific work as a scientist, but at the same time show consideration mingled with sympathy in their well being and that of their family and in their difficulties to solve problems outside the laboratory. These actions always bring fruitful returns in the way of greater reliance and confidence in the manager on the part of the researchers. On the other hand, the manager gets opportunities as a result of informal contacts to size up better the competence, attitude and capability of his research scientists and workers.

Changes in Objectives

52.4.76. The original objectives of almost all the institutes have suffered, we observed, modifications including deletion, revision and expansion in course of years, but in most of the

cases the reasons for such changes were not traceable. It is essential that everyone of the institute should be aware and take cognisance of the objectives in their actions and precepts. For creating awareness the objectives should be displayed prominently in the institute. About the research policy of the institute, there was a general lack of awareness. The primary intention in emphasising these apparently trivial things is to know how much the scientific research staff are at one with the institute and with one another in the matter of fulfilling objectives following certain broad policies as a team. The spirit of dedication and purposiveness can be inculcated if all feel that they serve a common cause.

Categories of Research

52.4.77 Admitting that research is one continuum, we tried to subdivide it into basic, applied and adaptive in the Interim Report on SAARET with the intention of delineating areas of responsibilities in matters of research among the various research agencies in the country, namely, the research institutes, universities and State departments. In course of our rather extensive visits to the various research institutes and agricultural universities and discussions with research workers of all categories, we became more confirmed in the following observation we made in the Interim Report:

> "What often passes as fundamental research in agriculture is but a variation of a similar study done elsewhere having little or no relevance to our conditions. Sometimes, research workers having no connection whatsoever with the field of specialisation conduct work in sheer oblivion of the actual problem. Conditions such as these necessitate reorientation of curricula in teaching institutes insofar as agricultural education is concerned. Infact, a conspicuous lack has been

> noticed of a strong research base which ensures trained personnel of proper calibre in adequate numbers in agriculture for the purpose of manning research institutes and guiding fundamental research in agriculture. The need for creation of centres of fundamental research in agriculture therefore becomes imperative. It is actually with this objective in view that the concept of agricultural universities was mooted."

52.4.78 We were not at all surprised to find that the understanding about the three categories of research stated above among the scientists varied a great deal, let apart some amount of confusion as regards the scope of each category. In fact, confusion is likely because of the possible overlapping of one category with the other. However, expediency and convenience demand that there should be an attempt to list projects, as far as reasonable, into the three categories and allocate responsibilities according to competence and inclination of scientists. It must be admitted that basic research may take longer time for fruition and should not be compared with the usual time-bound applied research. As a result of our discussions with the scientists at various levels of attainment and maturity in the different research institutes and agricultural universities we were further strengthened in our views on the basis of which the recommendations in the Interim Report on SARRET were made. We, therefore, feel more convinced in them and reiterate them as they are.

Identification of Research Problems

52.4.79 The problems of research should strictly be in keeping with the objectives of the research institution. Identification of such problems is no easy task. Each institute has its own way of doing it, but there is a more or less common procedure of sanctifying it at the level of the staff research council (SRC). Projects submitted by scientists and usually

discussed and approved at the divisional level come up before the SRC for final approval and monetary sanction. Each project has a leader with one or more research scientists and assistants as supporting staff. The leader is responsible for the working of the entire project. There is ordinarily a limit to the number of projects in which a scientist may act as a leader or as supporting staff but there is no uniformity in this regard in the various institutes. In order that the projects are in accord with the objectives of the institute the research staff should be acquainted with them. The objectives are often broad enough to accommodate any suitable project. Then there is the SRC, the supreme body to keep a check. Most often the researcher gets at this problem by reading scientific literature in his own discipline either Indian or foreign, and somehow tries to fit in with local or Indian situations. Rarely does he go out in the field and pick up his problem from his own direct observations or of those of his colleagues engaged in field work. Often the Head of the department and the senior scientists of the department by virtue of their contacts with scientists in other places, both in India and abroad, throw up problems to younger scientists who study on their own and prepare projects in which generally the Head of departments or the senior scientists are the leaders. Once in a while the juniors are given the leadership of projects that are of minor importance.

52.4.80 From discussions held at the various research institutes with the research workers we have the impression that the SRC is not an effective body partly by virtue

of its size, and partly due to the most commonly observed lack of interest of one department in the work of another, and of the lack of constructive, free and frank criticism so important in sustaining the spirit of scientific enquiry. The SRC thus turns out to be a routine approving body. Whatever criticism or scrutiny a project receives is at the divisional or occasionally at the individual level. But there also, the same lack of interest in another's work and lack of constructive criticism makes the whole process a drab routine. It is, therefore, observed that it is the scientists' individual sincerity and capability and not team work that is at the root of project formulation and implementation. In most of the institutes hardly two or more divisions agree to formulate a project jointly, but at the instance of the SRC there is a certain amount of cooperation at the implementation level. It appears that the attitude of multidisciplinary and interdisciplinary approach to the solution of problems has not sufficiently developed amongst the scientists. It is the responsibility of the Director and Heads of the departments of the institute to see that the scientists inculcate in them the spirit and philosophy of multidisciplinary research. The SRC is the most important body of the institute which, apart from identifying problems, should consciously attempt to develop interdisciplinary research, for example, by sanctioning more funds for such projects as one of the most effective means of attaining the objectives of the institute. The unwieldy nature of the SRC has often stood in its way of functioning properly, and there have been suggestions to reduce the size and make it more active and effective. We agree with this suggestion. It is

gratifying to note that some of the institutes have already taken action.

Organisational pattern

52.4.81 The research organisational structures of the institutes are broadly similar and appear to follow a set pattern. Where teaching is done in addition to research work, the setup is obviously different in some respects. An institute divides its work into divisions based on more or less recognised disciplines. Within each division, there are sections/units which are based either on specialisations within a discipline or on species or both. Each division has its head, and each section or a unit is in charge of a senior scientist. The research work is distributed as mentioned earlier in the form of projects among scientists each of whom may be entrusted with one or more projects, depending, among other factors, on his competence. Each project leader whether in charge of a section or a unit is made responsible for his research performance. As mentioned earlier (paragraph 52.4.79) research projects are normally discussed at divisional research councils and passed on to the Staff Research Council(SRC) of the institute for scientific approval. The financial approval is accorded by the executive council of the institute. The SRC has been in most of the institutes in a moribund state for one reason or the other and it is the divisional council which does the scientific scrutiny, only the routine sanction being left to the SRC.

Pooling of Instruments

52.4.82 It is common experience that costly instruments, many of which are imported, suffer from poor maintenance,

repair and underutilisation. Lack of spare parts and bad handling by a number of research workers who perhaps use the instruments only occasionally are responsible for poor maintenance leading often to complete breakdown. A scientist considers it prestigious to 'own' a costly instrument by himself, even though he may not utilise it to its full capacity and hence many a machine-hour is lost. Most of the imported instruments may not be fully tropicalised, and as such require air-conditioned and dehumified rooms for their upkeep. This entails recurring expenditure for which finances may not be always forthcoming. In order to save costly instruments and at the same time make full utilisation of them two steps suggest themselves. Firstly, to pool all the instruments in one big room which may be more cheaply air-conditioned than when they are dispersed in several rooms. Secondly, to appoint a set of trained technicians to make routine measurements under the guidance of a scientist and keep the instruments in running order. The technician should have sufficient knowledge to repair minor defects and keep the measurements accurate by daily checks. One technician may be incharge of one or more than one instruments depending on their type. The technicians will, therefore, help save not only the instruments but also the time of research scientists who need not unnecessarily spend hours to make routine measurements. A system of strict log-book keeping would be sufficient to make measurements for all concerned without much of delay and partiality. Science develops on the basis of cooperation. This is an example of such cooperation at a very low but essential level. This arrangement, it is needless to say, applies to cases where an instrument is

available for general use, i.e. a research scientist does not use it for all the time for his work. In that case a duplicate set should be made available for the pool.
A good central workshop staffed with competent men and necessary materials to design and fabricate instruments and repair them acts as an essential support to the institution of pool mentioned above.

Team Work

52.4.83 In view of what we mentioned in the introductory section about the inherent nature of multidisciplinary research in agriculture, a question was posed regarding the place of interdepartmental/ interdivisional/interinstitutional projects, if any, in the research setup of the institute. Most of the institutes which we visited have one or more projects in which one/two other divisions than the orginator department/division/ institute were involved or took interest, but there was hardly any in which more than one department/division/institute took part at the formulation stage and planned and executed its implementation as one of their own. The real multidisciplinary spirit was, in fact, missing from the so called interdepartmental/ interdivisional/interinstitutional projects. In the absence of such collaborative approach we observed duplication of efforts and instrumentation in some of the institutes, which should at all costs be avoided.

Sharing of Achievement Credit

52.4.84 It is common practice on the part of the head of a section/division/institute to demand a share of the credit of scientific achievements of his juniors. This practice takes various forms. One of them is to associate his name

with the research publications based on the junior's work. Another is to attach his name to a number of projects which are being run in the section/division/institute. The higher the position of a head in the hierarchy the greater is the chance of getting his name associated in this way. Where the head is actively doing research work or assists his juniors in guiding or giving ideas such credits are definitely his due. But instances are galore where this normal behaviour is violated. In the allocation of projects also, considerations other than scientific competence play their part. As such one may be deprived of his due share, while another gets more than he is capable of handling. In the matter of distribution of projects, therefore, equity should be maintained in strict conformity with the ability of each of the research scientists, but in no circumstances should even a capable scientist be overburdened with responsibilities. By doing so, the credit for scientific achievements, whether in the form of research publications or patents or winning prizes etc. would be distributed equitably. Except when the head of section/division/institute has not substantially contributed to a research work, he should refrain from trying to gain credit out of it. This act on his part would be an incentive to junior workers and set an example for the senior scientists. He should, in addition, publicly mention where praise is due.

Research Publications

52.4.85 The quality of research publications even by a single individual reflects on the standard of research work of the institute as a whole. It is, therefore, incumbent on the heads of section/division/institute to be

vigilant about the quality of material to be published from the institute. This would entail thorough scrutiny of each publication, whatever be its size, at the proper levels, not only for its scientific content but also its presentation, language, getup etc. In fact, each institute should have a competent publication section entrusted with the latter part, namely, presentation, getup etc. By this suggestion it is not meant that the scientists themselves should not try to acquire proficiency in presenting their papers well and be conversant with some of the essentials of good publication. But the scientific content has to be scrutinised by competent scientists. Preferably, all papers intended for publication should be presented in divisional seminars, and often in joint seminars, if the subject is such as to border on other disciplines. The seminars should be the forum where neither mutual admiration nor callousness has any place; a real spirit of scientific criticism and appreciation should prevail. If the scientific content of the paper is accepted in a seminar, the author(s) should revise it in the light of suggestions, if any, and present it to the publication section for improvement of presentation etc. If not accepted, the author(s) should take the criticism in the proper spirit and modify the paper in the manner suggested. In no case should a paper pass inadvertently for publication.

Participation in Conferences

52.4.86 The importance of participation of research scientists and workers in conferences, seminars and symposia held either within the country or abroad is well recognised. Some time back this function was

monopolised by the heads of the institution/division ignoring the claims of the junior and active scientists who would have benefited and deserved more. Whatever may be the reasons the situation is now changing for the better, some degree of democratisation having been introduced in almost all the institutes. In the choice of participants the scientist who has made the major contribution should be preferred even though junior. The choice of a younger research worker is suggested in view of the fact that it would act as an incentive to him and give him experience and opportunity to learn by conferring with his peers and contemporaries elsewhere. It may, however, be emphasised that every scientist who is so selected to participate should be properly groomed, for which the senior scientists having experience should be held responsible. A good performance by one of its scientists anywhere adds laurel to the institute, and should be looked upon as a matter of pride and prestige in a competitive field.

52.4.87 There is literally a craze throughout the world for holding conferences, seminars, symposia, workshops, etc. by research institutes, universities and scientific societies. These give scientists and research workers to mingle and exchange ideas with one another, but there is need for moderation. It has been said of some scientist-administrators that they have to sign official papers while changing planes at the airport. It sounds exaggerated but not quite untrue. The bigger the stature of the institute or agency and of the person heading it, the truer this kind of situation is for him. Heads of institutes and divisions often vie with one another to make their importance felt elsewhere, but by

absenting themselves from their normal duties at the headquarters. Outside contacts and attendance at meetings are sometimes obligatory. The person concerned should so arrange that he is not absent from the headquarters for more than seven working days in a month. In case of being called upon to be away for more days he should either send a nominee or excuse himself out. By the usual way of rationalising attendance at every meeting to be an essential duty, the primary work at the institute is neglected. In no time lack of seriousness begins to permeate among workers at all levels. This harmful trend should be put an end to, by making it obligatory on the part of all categories of research workers including the heads of divisions and institutes not to be away except under special circumstances, for more than one week or so from the headquarters for attending meetings, conferences, symposia etc.

Yardstick of Evaluation

52.4.88 In our questionnaire (Appendix 52.3) we asked the institutes to list at least five of their outstanding achievements in the different categories of research. Whether it is food crop or fish or animal, the achievements refer to high yielding and high input requiring varieties. The aim of all these researches was to evolve varieties having high production potential. In most of these researches the techniques employed were well known and no new grounds have been explored either in the form of techniques or knowledge. However, the information obtained is applicable under favourable conditions to exploit the production potential of the evolved varieties. Frankly

speaking, it is doubted if more than half a dozen achievements would fall under the category of outstanding. We expect such achievements to be mentioned in textbooks, monographs and referred to in scientific papers by other scientists outside one's own school of research. This is one of the accepted international yardsticks of assessment. Within the country or one's institute there may be different methods of evaluation. If the same methods are used in all the research institutes and agricultural universities a comparable yardstick may emerge. We have mentioned earlier that any research paper or publication emanating from an institute should be subjected to scrutiny in regard to the scientific content, presentation and getup. The process, if carried out objectively, would understandably improve the quality and hence establish reputation of the institute. This internal evaluation is acceptable provided leading scientists in diverse fields are available in the institute for the purpose, otherwise the procedure can mislead the investigator whose publication is being reviewed to believe that his research is of high quality, but in reality it may not be so judged by more competent panels. In that case leading scientists outside of the institute should be engaged for the evaluation. From our discussions with the research workers and replies received to our questionnaire we had the impression that none of these procedures are being followed in the matter of improving the quality of research work and of research publications. Neither do they have any other procedure or any thought on this important matter.

Interrelationships

52.4.89 In regard to the relationship between universities and State departments, the replies by the institutes were more or less in the same vein. Formal relationships except through some coordinated projects were generally absent. However, on a personal basis scientists could establish some linkages which the executive authorities allowed. Agricultural research as we envisage should be the joint responsibility of the central institutes, universities and State departments among which certain broad areas of responsibility have been delineated for the purpose of improving quality of research and efficiency of field application. The central research institutes, according to our recommendation made in the Interim Report on SAARET should be engaged in fundamental and applied research especially on those problems which are of long duration and are of national importance. There is, therefore, scope for some State problems coming within the purview of the central research institutes and hence of the necessary collaboration with universities and State departments. Unless formal collaboration is established and the present watertight arrangement is done away with no significant breakthrough in scientific efforts is likely to emerge.

52.4.90 The central research institutes used to collaborate with State departments which were the custodians of State research activities for the testing of research results under different agroclimatic conditions. Eventually the central institutes found it necessary to set up their own substations for the same purpose. In some

cases both the State Governments as well as the Central institutes have substations, perhaps at about the same locations. There is no doubt duplication of efforts, but because of disparity in emoluments and facilities awkward situations arise. Often the administrative machinery of centrally controlled substations would suffer owing to the distance from headquarters and consequent delay involved. With the establishment of agricultural universities in the States, the need for substations has been satisfied by the transfer of State substations, wherever they exist, to the agricultural universities. The State departments, we have recommended, should be entrusted with adaptive research and hence cannot do without substations. There are three claimants for substations of which two are in the State sector. Of the latter the substations required by the agricultural universities are for research as well as teaching and hence should preferably be under their control.

52.4.91 Triplication of substations being out of question, the most feasible arrangement seems to be to put the substations of central institutes under the control of agricultural universities, but making the facilities available there to the Central institutes and the State Governments either for collaborative or for independent work. With this idea in mind a specific question was asked as to whether the substations under the control of the institutes could be transferred to the universities or State departments. Two/three institutes were categorically against the transfer, whereas the rest were inclined to agree with the transfer provided the universities or State departments are capable of running them properly and they allow the institutes to use their facilities whenever required.

5 AGRICULTURAL UNIVERSITIES AND STATE DEPARTMENTS VIS A VIS RESEARCH INSTITUTES

52.5.1 The ICAR research institutes have been recruiting, before and during the early part of the sixties, their research personnel from the general universities. The same was true of State and other institutes involved in agricultural research. It has become gradually apparent that such personnel should have a different background from what is available in the general universities because of the peculiar nature of agricultural sciences and their approach and training. Keeping this in mind the Joint Indo-American teams recommended the establishment of agricultural universities in which teaching, research and extension education are integrated in a balanced manner. The inspiration was drawn from the USA's Land Grant colleges. Earlier the University Education Commission (1948-49) recommended the creation of rural universities on a similar model. As coordinator of agricultural research in the country, the ICAR gave the necessary financial and organisational support to the idea and idealism of agricultural universities. The latter hinges essentially on the integrated approach to teaching, research and extension education. In this section we are dealing with the role of agricultural universities (Appendix 52.4) in agricultural research vis a vis other agencies. Most of the universities have tried to follow the Model Act framed by the ICAR in a broad sense, so that a more or less uniform pattern has emerged. This may be desirable to a certain extent and hence the ICAR's guidance in this respect is appreciated. But guidance is often replaced by direction and regimentation, which are uncongenial to a research climate.

Since research is intimately connected with extension and field application, and since agriculture is State responsibility, directed research may not be appreciated. The conflict came to the surface in the matter of complete transfer of research responsibility in agriculture from the State Government to the agricultural university. It is still on the surface in some of the States, but though slow the transfer will eventually take place. Realising the fact that application of agricultural research to the field requires a chain of authorities, we went at great length in our Interim Report on SAARET to define categories of research and allocate responsibilities for each category to the agencies concerned. The Government of India and the ICAR accepted the recommendations made in the Interim Report, but the attempt to deprive the State departments completely of agricultural research obligations has gone on unabated. The State Governments have, it seems, found it easier to shake off their legitimate responsibility, more likely because of financial constraints. The State Government need not loosen its hold on agricultural research in despair because of financial difficulties. It is through proper management of agriculture that the economy can be pushed upward. In this context the following remarks made in the above Interim Report are relevant :

"The Commission, however, considers the establishment of agricultural universities in different States as a most welcome and desirable innovation. Because of lack of understanding, the two organisations* instead of being complementary and

---

* Agricultural university and State departments.

supplementary to each other have unfortunately involved themselves into unhealthy rivalaries. This fissiparous tendency is deterimental to the scientific development of agriculture and must be nipped in the bud. There is enough scope for both the organisations to purposefully serve the cause of agriculture in their own spheres of activities by collaborative and cooperative efforts, instead of working at cross-purposes. It is, therefore, necessary to have a clear-cut delineation of responsibilities between the two organisations*, and evolve suitable arrangements for coordination both at the policy-making and implementation levels*.

52.5.2 We have earlier said that the expected impact of research findings on production and productivity has been hardly noticeable, owing, among other factors, to lack of adequate extension work. We are strongly of the opinion that by impoverishing the State departments in respect of their research capabilities the extension work would be further weakened, and affect adversely the transfer of research results to the field.

Basic Sciences in Agricultural Universities

52.5.3 A scrutiny of the ad hoc schemes and projects submitted to and sanctioned by the ICAR for financial assistance indicates that the emphasis is on applied research, a large proportion of which is just repetitive. The dearth of schemes on fundamental research pertaining to agriculture is conspicuous. This situation has arisen because of the stepmotherly attitude of agricultural universities to basic sciences. It deserves close

---

* Agricultural university and State departments.

scrutiny. Most of the agricultural universities have got a college of basic sciences and humanities, which is required to offer among others, courses in such basic sciences as physics, chemistry and mathematics to undergraduate students only. The teachers of this college do not always enjoy the same rank and status as those of the other colleges. Moreover, not having to teach at the graduate or postgraduate levels, job satisfaction is not fully achieved by the teachers. Neither do they find postgraduate students, ordinarily from general universities, interested in research work in agricultural universities, even though sometimes better facilities are available in some of the agricultural universities. In fact, all agricultural universities do not attach equal importance to research work in basic sciences. The situation is anomalous. No well qualified scientist would like to join the college of basic sciences in agricultural universities unless facilities for research work both in men and materials are available. As a consequence, basic science teaching would be left to less qualified teachers and teaching would suffer. The teaching of basic sciences is already poor in agricultural universities, because the need for a sound basic science college was realised late, and it was given a stepmotherly treatment. In the event of failure to attract qualified teachers the teaching would still suffer. Allowing the truncated college the status of a fullfledged one having postgraduate teaching and research facilities leads to complications and there are instances where the grafting has not worked. The basic science college would, therefore, remain as an undergraduate one, unless a

reputed science teacher, by dint of personal efforts, can build up a school of his own and attract research workers in his field from general universities. In such perhaps rare cases the university should not fail to give him full support. Some teachers in basic sciences may find it worthwhile to initiate research on subjects bordering on agriculture and there are innumerable attractive problems of research so that a liaison can be gradually built up. It is through such personal examples that a good and viable edifice of basic sciences can be created in agricultural universities. Or else, agricultural graduates showing proficiency in basic science subjects may be given special training to enable them to teach basic science courses. Teachers so trained should find the atmosphere more congenial and less frustrating than their pure science counterparts.

52.5.4 Even if some kind of grafting arrangement suggested above works out in the long run, the problem of teaching basic science subjects may be solved, though not satisfactorily. But basic research would still go by default unless some radical changes are brought about in the entire research structure of agricultural universities and research institutes. Before thinking about changes it is necessary to be clear about the scope and need of basic research in agriculture. In our Interim Report on SAARET, we discussed this issue at great length and tried to draw the line of distinction between basic and applied research, especially with the purpose of allocating responsibilities for each to universities and ICAR research institutes. Relevant extracts from this Report appear in section 2 paragraphs 52.2.5 to 52.2.8.

General Universities vis a vis Basic Research in Agriculture

52.5.5 Prior to 1960 when the agricultural universities came into existence research work in agricultural sciences was carried out mainly in Government research institutes. Occasional *ad hoc* research grants were sanctioned by the ICAR on time-bound schemes submitted by individual scientists of general universities. Most of the *ad hoc* schemes so submitted were concerned with some problems basic to agriculture but not necessarily of immediate interest to agriculture. Such research schemes were encouraged not without a purpose. There were many problems of a basic nature in agricultural sciences which awaited solution. But because of the fact that agricultural research institutes were interested in immediate field problems their sole attention was focussed on them. As a consequence the development of competence in basic research went almost by default. The interest shown in their individual capacities by some of the scientists of general universities in basic issues pertaining to agricultural subjects was, therefore, welcome. The encouragement and financial assistance meted out to them were not at all misplaced. As mentioned earlier, the problems of interest to these research scientists were not always of immediate concern to practical agriculture, i.e. the results of their research might not have found ready application in the field. In spite of this lacuna those research efforts of individual scientists of general universities could build up robust centres of research on subjects basic to agriculture. And in spite of the *ad hoc* nature of schemes a few could manage to continue their useful work by getting more than usual extensions.

52.5.6 With the establishment of agricultural universities, they have been getting slowly but surely a greater share of financial assistance for agricultural research, even that earmarked for ad hoc schemes. This would have been a welcome trend had the agricultural universities, either institutionally or through their scientists, taken upon themselves the task of organising basic research relevant to agriculture. The experience over the last decade and a half is that this has not been so. As a result basic research has found the least priority in agricultural universities. This is definitely a selfdefeating trend. This fact actuated us to emphasise this issue in our Interim Report on SAARET (vide paragraph 52.2.8). The relevant recommendations made in the same Interim Report (paragraph 5.7) runs as follows:

"Centres of fundamental research must now be developed in the agricultural universities. These will have to be held by scientists of the foremost calibre selected from out of the best in the country, whether they come from the agricultural universities or from the main stream of sciences basic to agriculture, animal husbandry and fisheries. These scientists shall be provided with a team which can help them in continuous fundamental research and they shall be suitably funded so that the vagaries of budgeting do not upset important research work from time to time. This can be done in our opinion by the creation of large number of Professorial Chairs in the agricultural universities generally and a few for basic sciences in the general universities for undertaking fundamental research in these sciences".

52.5.7 The manner in which this recommendation should be implemented at the earliest possible time has also been outlined in the Interim Report (paragraph 52.5.11). It is gratifying to note that the ICAR has given active consideration to this recommendation and steps are being taken to implement it.

52.5.8 The reasons for the neglect of basic research in agricultural universities were more psychological than rational and scientific. Basic researches take more time for fruition, and recognition may be delayed too long to be of immediate interest to a scientist, when he can do some applied research and may win recognition sooner. Because of long duration usually required for basic research, there should be occasional say, quinquennial evaluation of such research work so that the scientists may be sure that the work is proceeding in the right direction and that they do not become too complacent.

52.5.9 The agricultural universities should take up, in their stride for carrying out research work, more and more of basic research related to agriculture, and formulation of such projects as part of their own research programmes. A suitable proportion of <u>ad hoc</u> research schemes should preferably be sanctioned in the general universities, for which necessary encouragement should be given. The general universities may in this way act complementary to the agricultural universities insofar as basic research in agriculture is concerned.

52.5.10 Regarding the relative importance of basic and applied research to be undertaken by the agricultural universities and Central institutes we expressed ourselves

clearly in the Interim Report on SAARET. The universities should primarily engage themselves in fundamental or basic research, but since a healthy symbiosis is required to be created between basic and applied research, it is highly desirable that the universities also take up some applied research work. The Central research institutes should engage themselves more thoroughly in applied research and some basic research as well but they are required to concentrate more on such problems as are of national importance, or on items of research which may spread over longer period. For the purpose of conducting applied research the agricultural universities should have facilities of regional research stations. A recommendation to that effect was made in the Interim Report on SAARET, which we reiterate.

State Departments' Research Responsibilities

52.5.11 We made specific recommendations regarding the role which the State departments have to play in the matter of adaptive research. Because of the use of the expression 'adaptive research', particularly the word 'research' a view was expressed in certain quarters that by giving the responsibility of adaptive research to the State departments, duplication of research work would take place. The demarcation was made so clear in the Interim Report that such a view was unfounded and unnecessary furore was raised by some of the universities. In the Annual Report of Department of Agricultural Research and Education (DARE), 1973-74 , the following sentence originating from the Vice-Chancellors Conference appears (p.119) as if to remove the misunderstanding caused: "The Union Minister for Agriculture addressed all the

Chief Ministers of State Governments requesting them to ensure that only verification of the new technology in farmers' fields and demonstrations, soil testing, seed production, etc. were carried out by the State Departments". We find in this statement a deliberate attempt on the part of the agricultural universities to destroy the idea enunciated by us in regard to adaptive research and the significance of strengthening the State departments to enable them to be equal to the task. We, therefore, consider it necessary to reiterate with full conviction the recommendations we made in respect of adaptive research and the responsibilities of the State departments vis a vis the agricultural universities. We must not be carried away by the success achieved by some of the agricultural universities to put across results of research throughout the State. The latter responsibility is not really that of the universities which should not dissipate their resources and talents for such extension work. They should, on the other hand, address themselves seriously to basic and applied research for which they are academically and organisationally more suited, leaving adaptive research followed by extension on a large scale in charge of the State departments.

6 RESEARCH ORGANISATIONS OTHER THAN AGRICULTURAL UNIVERSITIES AND ICAR INSTITUTES

52.6.1 Agricultural universities, ICAR research institutes and State Departments of Agriculture are the recognised centres of agricultural research. Before coming into existence of agricultural universities scientists in several general universities started doing agricultural research in their individual capacities. As mentioned earlier, they could gradually develop one or two modest centres of agricultural research. A few others were able to set up fullfledged departments/faculties of agriculture in general universities such as Calcutta, Banaras and Viswa Bharati. The research publications coming out of the general universities show that about 26 of them shown in Appendix 52.5, are involved to some extent in agricultural research. Most of their research work is on problems basic to agriculture and the main financial source is either the ICAR, CSIR or UGC ad hoc grants on scheme basis. Except in a small number of cases the continuity of research on a particular topic has hardly been maintained, because of the uncertainty of such ad hoc grants. However, the researchers in these institutions eke out their scientific life precariously. There are a large number of non-ICAR research institutes which encourage as part of the institutes' projects schemes of research related to some aspects of agriculture. In some out of these institutes, scientists may manage to get in their individual capacities, financial assistance from either the ICAR, CSIR or UGC on schemes of agricultural research, mostly again in areas basic to agriculture. The sum total of all these

sundry contributions may not be inconsiderable, but there is no way of compiling them except through the publications coming out of these research organisations. The funding agencies have no particular mechanism for collecting the scientific contributions made under schemes financed by them. They are satisfied if the accounts are properly submitted after termination of schemes. This is not a laudable attitude, and there is obviously room for a change. It has already been mentioned in paragraph 52.4.14 that it may be worthwhile to follow up the scientific contributions of ad-hoc schemes in a suitable manner. We are of the view that the funding authorities should apply their minds in this direction. They should not merely be satisfied with the monetary accounting part of schemes. In the absence of an objective assessment the project may run routinely without any tangible returns whatsoever. It is true that by widely distributing the schemes an infrastructure is created throughout the country of research personnel but that itself is not going to be helpful unless there is some kind of planning and a follow up. The list given in Appendix 52.5 of organisations and institutes interested in agricultural research is not exhaustive, but it includes many which do not depend upon any outside financial assistance but their own. It is expected that research work sponsored by them is more gainfully utilised.

Commodity Crop Boards

52.6.2 The production, improvement and marketing of the four commodity crops, namely, rubber, coffee, tea and cardamom are managed by what are now known simply as boards. Perhaps because of the commercial importance of the crops the boards

are attached not to the Ministry of Agriculture & Irrigation but to that of Commerce. They are constituted similarly and function in nearly identical manner with similar objectives. In our Interim Report on Certain Important Aspects of Selected Export Oriented Agricultural Commodities, we dwelt elaborately on the current production, consumption, export and future outlook and approach in regard to these crops. In this Section we would like to give our view regarding the research set up in respect of these commodities. The production, yield and area under cultivation of these crops show varying trends. While the trends are upwards in the case of rubber and tea, those of coffee are somewhat fluctuating. In the matter of export coffee shows a definite upward trend but in case of tea fluctuation is to be noticed. For each of these crops we recommended developmental, extension and organisational measures to be taken to improve production and quality, and promote internal consumption and export. A small quantity of rubber used to be exported during the fifties, but there is no export now; on the other hand, a very small quantity (less than 0.5 per cent) of natural rubber is shown to be imported. Cardamom shows nearly constant area, production, and yield over the years. The yields of cardamom varies widely from plantation to plantation.

52.6.3 The research setup of the rubber and coffee boards, that is, of the rubber and coffee research institutes is more or less of the same pattern as any of the ICAR or Council of Scientific and Industrial Research (CSIR) institutes. Tea Board's performance, namely, in maintaining

an upward trend in production and yield of tea, reflects its capability of benefiting from its own sponsored research work as well as from those done by other institutions. However, the Board should place its emphasis on production and promotion of internal consumption and export in the manner recommended by us in our Interim Report mentioned above. Similar remarks apply to the Coffee Board. Rubber Board's performance shows an upward progress in production as well as yield per hectare. Its primary responsibility is to increase production and promote internal consumption. Cardamom production is handicapped by lack of any research support. Katte disease for which there is no remedy except replantation takes a heavy toll. Judged by their overall performances, the research institutes of the coffee and rubber boards appear to be fairly efficient. If the administrative control of the research setup is free from bureaucratic formalities of rules and regulations, the research climate is bound to be more conducive. We would recommend that the coffee and rubber research institutes now under the Ministry of Commerce be handed over to the ICAR. The coordinated project of ICAR on spices and cashewnut should pay special attention to cardamom. The other division of the boards may continue to be with the same Ministry as they are now.

International Research Collaboration

52.6.4 Science is universal and knows no national boundary. The application of science through technology is, however, conditional, and depends, in the case of agriculture, on soil, climate, input resources and socio-economic factors of the region. Simple implanting of borrowed knowledge without

appropriate adaptation would not do. Scientific and technological knowledge created elsewhere is available to the scientific community through publications. To apply them to solve specific problems requires infrastructure, resources of men and materials and management capability. The technology to be adopted depends upon the availability of these factors. Deficiency in some of them may be made good by borrowing or collaboration.

52.6.5 International collaboration takes various forms, viz., bilateral agreement or protocol, cultural exchange programmes, Colombo Plan, Special Commonwealth African Assistance Plan (SCAAP), International Technical and Economic Cooperation Programme, World Bank asistance, Ford Foundation grants, USAID, Rockfeller Foundation, PL-480 programmes and International Institutes. Chapter 64 on International Cooperation specifically mentions the various projects under which foreign assistance has been received by India and also donated by her.

International Research Organisations

52.6.6 There have been several ways of collaboration with international research organisations. The first takes the form of training and supply of research materials, e.g. improved seeds or strains as in collaboration with the International Rice Research Institute (IRRI) and Internionai Maize and Wheat Improvement Centre (CYMMYT). The second is financial and technical assistance for specific purposes as is offered by International Development Research Centre, Canada, on projects on aquaculture research at CIFRI, Barrackpore; post-harvest technology research at IARI, New Delhi;

University of Udaipur, Udaipur; Punjabrao Krishi Vidyapeeth, Akola; CRRI, Cuttack; and Tamil Nadu Agricultural University Coimbatore; and triticale research at Pant University of Agriculture and Technology, Pantnagar. The third form is more elaborate, involvement and responsibility of India being much greater than in the other two. The only example of this form is the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) established in July 1972 near Hyderabad. The objectives of this Institute are:

i) serving as a world centre to improve the genetic potential for grain yield and the nutritional quality of four crops - sorghum, pearl millet, pigeon pea and chickpea;

ii) developing farming systems which will help to increase and stabilise agricultural production through better use of natural and human resources in the seasonably dry, semi-arid tropics; and

iii) assisting national and regional research programmes through cooperation and support and contributing further by sponsoring conferences, operating training programmes on an international basis, and assisting extension activities.

The Institute has concerned itself with researches on sorghum, bajra, Bengal gram, arhar and groundnut, which have begun with screening and breeding on an extensive scale. The institute also arranges international workshops and seminars on topics related to its objectives. Two such seminars have been held so far, one on farming systems, and the other on grain-legumes breeding.

52.6.7 Throughout the world scientific and technological collaboration is an accepted principle, irrespective of the degree of development of the countries concerned. This is mainly the result of fragmentation of science into

specialisations. Had it been simply a case of scientific and technological collaboration the situation does not call for any further thinking. But there are undertones. Leaving aside commercial and political aspects, an underdeveloped country seeking collaboration of a developed country often stands to lose in the long run. Becuase of ready help received, complacency prevails which cuts at the root of self-reliance. This is a natural tendency and can be illustrated. The opposite has also happened, though rarely. Because of these possibilities all collaboration should be sought with proper caution and foresight. The flow of technology is usually from the more to the less developed country from which the latter gains much. But the experience gained in such collaborative efforts is shared by the whole world and the posterity.

7 RESEARCH ADMINISTRATION

The ICAR, CSIR, ICMR and AEC - a comparative study

52.7.1 The usual practice of subjecting an organisation to scrutiny and assessment either at regular intervals or whenever exigencies arise is a healthy one. The development of procedures in which checks and balances operate is vital to any institution. The different research organisations in the country including the ICAR have gained considerably in stature and importance as a result of the periodical scrutiny and review to which they have been subjected from time to time. Even then the successes - both in a scientific and administrative sense - achieved by the different research organisations are not of the same level. Neither do they have the same pattern of organisation - each having been evolved basically on the basis of leadership and guidance provided at the formative stage. It is believed that management of research in an organisation is often determined by its setup and structure. A comparative study of the organisational structures of some of the research agencies in the country, e.g., the CSIR, Indian Council of Medical Research (ICMR) and the Atomic Energy Commission (AEC) may be helpful to find out the most efficient setup and thereby suggest improvements, if at all, in the organisation of the ICAR. However, the inherent limitations of such a comparison should be laid down at the very outset. Each of the research agencies/organisations differs essentially and significantly in the scope of application of the results of research. The CSIR caters to the need of industries which are more or less centralised and located in urban and near-urban areas. The work of directly extending the research results is, therefore, of a

limited nature and involves sophisticated technologies and persons well founded technically as well as financially. The ICMR's involvement is more wide and covers problems and people of rural areas especially in its programmes concerned with human fertility, nutrition and communicable diseases. The AEC broadly concerned with a narrow specialisation is highly sophisticated. It has no mentionable direct involvement with the masses insofar as application of results of research is concerned. Whether in industry, in medicine or atomic energy, the application of results of research would be more or less valid throughout the length and breadth of the country. They may, in fact, often be borrowed from another country and applied with a little adaptation or none at all. By comparison the application of agricultural research is concerned with the individual farmer, mostly illiterate and poor, at the remotest corner of the country, involving as it does a large species of crops, animals, trees, etc. Moreover, the results of research ready for application are location-specific and may not be equally valid except in broad principles for all parts of the country. Each of the agroclimatic regions into which the country may be divided poses distinct problems requiring different approach and methodology for solution. For the same reasons, organisational setup in the developed countries having altogether different agroclimatic and socio-economic conditions may not be applicable at all under Indian conditions. These differences in the various research organisations have been highlighted in order to bring home the point that what is appropriate and effective in one

organisation may not necessarily be so in another. Against this background the main structural ingredients of the three other research organisations mentioned above are described below.

52.7.2 The Council of Scientific and Industrial Research (CSIR): The CSIR was setup in 1942 as an autonomous Society, having as its objectives promotion, guidance and coordination of scientific and industrial research in India. To achieve this it has established research institutes numbering at present 34, and sponsors research projects in universities and other research organisations. A Governing Body consisting of 35 members of which the Prime Minister is the President lays down broad policies of the Council. It is advised on technical matters by a Board with the help of 13 research committees. CSIR is headed by a scientist as its Director General, who is also a Secretary to the Government of India. Each institute is headed by a Director and is guided by executive committee of which the Director is the Chairman.

52.7.3 The Indian Council of Medical Research(ICMR): The ICMR, like the CSIR and ICAR, is a registered Society. Set up in 1949, its aims are to assist and initiate research projects in its own institutes, which are seven in number and in other institutes. It is headed by a Director General but he does not have the status of a Secretary to the Government of India. The highest policy making body is the Governing Body consisting of 17 members and has as its President, the Union Minister of Health and Family Planning with the Director General, ICMR as the Member-Secretary. The day to day business is looked after by an executive committee

of six members presided over by the President of the Governing Body and the DG(ICMR) as its Member-Secretary. The Scientific Advisory Board consisting of 16 members is headed by the Director General of Health Services in the Ministry with the DG(ICMR) as the Member-Secretary. There are 35 advisory committees each consisting of 6 or 7 members in different aspects of medical research grouped into (a) basic sciences, (b) clinical sciences, (c) fertility, health and family planning, and (d) communicable diseases.

52.7.4 The Atomic Energy Commission (AEC): The AEC is the policy making body with regard to all aspects of peaceful uses of nuclear energy. Its Chairman is the Secretary to the Department of Atomic Energy. Unlike the CSIR, ICMR and ICAR it is not a society, but a Government department having all the powers of the Government. The AEC has got six (or seven)members, one of whom is the Director of the Bhabha Atomic Research Centre (BARC) which is the major institutions of the AEC for research and development. The BARC is headed by a scientist Director and assisted by the Trombay Council, which consists, besides the Director, of seven heads of specialised groups (chemistry, engineering, biomedicine, physics, reactor, engineering services, and electronics and instruments) located at the Centre. The AEC Chairman is honorary adviser to the BARC. The Council determines the policy and programmes of research. The routine matters connected with the day to day running of the Centre are looked after by a Controller with his adminstrative staff. Each group is divided into departments and sub-divided into divisions and sections based on specialisation. The directives to each group to implement the Council's policies

and programmes are given by the Trombay Scientific Committee which consists of the Heads of Groups as members and is headed by the Director of the BARC. The functions, powers and responsibilities of implementation are delegated to divisions which have their own divisional councils. The group leaders chosen for their managerial competence are not necessarily the highest paid. Any scientist, by virtue of his merits, may get a higher pay and be promoted to a higher position irrespective of any vacancy. The recruitment is made by one or the other of the following procedures: (a) direct appointment of outstanding persons, (b) direct appointment of highly qualified persons, (c) recruitment through training school, and (d) through advertisements.

52.7.5 In view of the limitations of resources and the imperative need of attaining critical mass, research workers, research facilities and natural and financial resources should be concentrated commensurate with the national policies and goals into those select programmes and projects of research which are likely to pay off most. In considering the critical mass and the compulsions that go with it, the question of management is very relevant. Management of research is becoming a more and more specialised job as a result of the increasing complexities of research and development organisations.

Pecularity of Research Management

52.7.6 H.J. Bhabha, one of India's foremost scientist-administrators once wrote, "It is thought by many that we are reasonably advanced in administration but backward in science and technology. The statement is misleading. We

have fortunately inherited extremely competent administrative service capable of dealing with all types of administration in what was intended to be a static and underdeveloped country. Consequently, experience of the type of administration needed for industry and for science and technology has been lacking. This type of administration required for growth of science and technology is quite different from the type of administration required for the operation of industrial enterprises and both of these are again quite different from the type of administration required for such matters as preservation of law and order, administration of justice, finance and so on.

"It is my personal view that the general absence of the proper administrative setup for science is a bigger obstacle to the rapid growth of science and technology than the paucity of scientists and technologists because a majority of scientists and technologists we have are made less effective through the lack of right type of administrative support.[1]"

52.7.7 As expressed by Bhabha, management of scientific and technological research plays a pivotal role in the application of results of research for development. The administration of agricultural research has to develop and maintain a research environment attractive to talented scientists and conducive to creativity. It must never lose

---

1 1966, Bhabha, H.J. Science and the problems of development, Vijnan Karmee, 18, No.1.

sight of the fact that the organisation is meant not only for scientists but also the community at large. Of the various aspects which require consideration in management the following are important:

i) Research, planning and programming.

ii) Personnel system.

iii) Organisational structure and decision making body.

iv) Finance and budgetary system.

v) Infrastructure.

vi) Relationship with (a) headquarters and Government, (b) similar other bodies, and (c) end users.

52.7.8 Research planning and programming: The primary objective of research is to gear it to developmental plans and programmes and help their successful launching. For this purpose it is necessary to have a satisfactory Research and Development (R&D) system, knowledge of the resources at command and the risks and gains involved. Research planning in one developmental sector, for instance, in agriculture, cannot be isolated from the other sectors and hence from the country's broad economic plan. In fact, the planning process should be interrelated and coordinated at the national, agency and laboratory levels. In a developing country research input for resource development has to be considerable. Again, the question of needs has to be settled in a balanced manner when the distribution of existing and potential resources is lopsided. At the national level the planning should be based on resource availability and needs, and elaborated as overall objectives, priorities and strategies. The agency

level should translate these objectives into scientific and technological work plans and implement them effectively. A beginning in this direction has been made by the preparation of a National Science and Technology Plan by the National Committee on Science and Technology which is now chaired by the Deputy Chairman of the Planning Commission. Actual programming and appropriate technological choices are to be left to the laboratories. The three levels are to work in constant consultation and in complete harmony with one another.

52.7.9 We suggest that all the scientists of a laboratory should be familiar with the agency's as well as the nation's scientific and technological objectives and country's socio-economic plans. They should also be apprised of the functions of the laboratory to further these objectives. Before the beginning of each Five Year Plan period each scientist would be required to submit annual as well as perspective plans of research for consideration of the laboratory council (vide paragraph 52.7.20). In this activity the scientists should preferably discuss matters of mutual interest with their peers and colleagues. A small body of scrutinisers appointed by the council should then go into the merits of the plans and projects on the basis of certain agreed criteria such as conformity with objectives, resource availability, cost-effectiveness, feasibility etc. The council should discuss the pros and cons of each plan and project at a full meeting of the members in the light of the findings of the scrutinising body. The authors of plans and projects should be entitled to answer criticisms in support of their cases at such meetings. The council should draw up agreed plans and

projects and make appropriate budgetary allocations. It has got other responsibilities to perform. It should not only see that the projects are in keeping with the objectives, but that there are no gaps to be filled up on a priority basis. It should then have projects prepared to fill the gaps and disburse them to the more competent of the scientists. The council should further delineate areas of interlaboratory collaborations and arrange to make such collaboration possible. We recommend that once the projects are distributed and budgetary allocations made for each project, the scientists-in-charge should be independent of any financial control within the budgetary allocation. They should, however, be accountable for the progress achieved and the expenditure involved at the end of specified periods, which may ordinarily vary from one to five years. In case of projects extending beyond one year, an annual progress report should be demanded for evaluation and midterm corrections, if any. However, to shoulder this responsibility the scientist should have training in financial and other appropriate rules (Chapter 62 on Administration). The accounting procedure should also be simplified while dealing with research management.

52.7.10 Personnel system: Personnel policy comprises recruitment, evaluation, promotion, training, mobility, relation between peers and others, etc. It should be free from the rigid and static frame of Government establishments. It can have the advantages of both Government and efficient non-government organisation. Instead of a hierarchical system with defined functions and status and seniority consciousness, a

collegiate system with appropriate freedom and responsibility and accountability is desirable.

52.7.11 Promotion: Merit versus seniority is a subject of eternal controversy even though it is admitted on all counts that merit should be recognised as the criterion for selection and hence of promotion. Experience which is often supposed to be gained with age goes in favour of a senior person, when promotion is concerned. But it is not always a truism. Where seniority is associated with useful experience for which proper evidence exists it may legitimately compete with merit. In Government establishments, by virtue of rules and regulations framed for the purpose of promotion etc., seniority generally counts. Research institutes, if compelled to abide by such rules and regulations, would in course of time be peopled by persons of low calibre and would fail to attract talent. To keep research institutes out of such morass, a more rational system of promotions should be followed based primarily on merit. The number of positions being usually small in research laboratories the scope of promotion is normally limited. Consequently, the rewarding of merit may have to be thought of in other directions. This difficulty arises because of the linking up of specific posts with grades. But, as in the CSIR or AEC the scientists are graded according to merit, promotion may be feasible from one grade to another without consideration of so called 'vacancies'.

52.7.12 Recognising merit as the basis of promotion, status and managerial position should be delinked from the scale of pay or salary. We are of the opinion that there should not be any bar in an outstanding scientist getting a higher emolument than that of the Head of the Department to which the scientist belongs, or even higher than that of the Director. Gradation of scientists into categories A to F, as, for instance, in the CSIR with overlapping scales of pay commends itself, in contrast to scales having well defined stages commensurate with status as in Government establishments.

52.7.13 Evaluation: The system of confidential reports still in vogue in the research laboratories, which is an imitation of what prevails in Government establishments has failed to offer a reliable and workable method of evaluating the merit and performance of workers in general and of scientists in particular. Being more of a subjective report it is likely to be clouded by personal factors. Instead, a scientist may prepare a statement amounting to assessment of his own work, on which the supervisor scientist and the Head of the Department should record their comments. A more objective evaluation may be possible in this manner. Any refutation of claims made by the scientist should be brought to his knowledge for necessary reply. The Director would then be in a better position to assess the scientist and rank him accordingly. The calibre and performance of a scientist may be judged not only by his laboratory work, but also by how he fares in seminars, group discussions etc., and his ability to undertake team work and appreciate its value. We are inclined to recommend that this procedure should be given fair trial.

52.7.14 Scientific career: Two aspects may be generally distinguished in the career of a scientist, namely, (a) genuine attraction for science, and (b) prospect of gainfaul employment. Both these factors arouse interest in varying degrees in different persons. Science for the sake of it alone interests only a few. Unless the proportion of dedicated scientists is increased, the expected impact of science and technology on development would be diminished. It is, therefore, in the interest of the laboratory that its scientists are given opportunities to upgrade their knowledge by occasional training in advanced centres, attending conferences and participating in seminars and symposia. There should be ways of recognising those who are serious-minded and show promise of devoted scientific careers. The selected persons should in addition be allowed to accept assignments of study and research work on sabbatical leave. The writing of monographs, reviews and textbooks is another important assignment which the competent scientists should be encouraged to take up. This is a very serious gap to which scientists have not paid the desired attention. Obsolescence is so rapid in the field of science that unless constant touch is maintained a scientist may find himself a stranger even in his own field of interest. Often administrative matters may keep senior scientists away from research work, who may thus lose direct touch with the current thinking. They may try to keep themselves uptodate with the help of research associates. But this process is helpful over a short period only. For promising and brilliant research scientists involvement in administration should be minimal, if at all. We recommend

that there should be arrangements to rotate administrative posts, so that after a lapse of 3 to 5 years a scientist may return to his research work. If possible, the acceptance of administrative positions for active scientists should be made optional, even if such posts are rotational. The atmosphere of the laboratory which allows freedom of junior and senior scientists to express freely opinions on scientific matters and decisions is conducive to the development of scientific careers.

52.7.15 Organisational structure: Organisational structure of a laboratory has a significant bearing on its performance. The laboratory structure is to a certain extent dependent on that of its Agency. But these structures are not permanent. They are subject to changes meant to rectify lacunae and introduce improvements. They are brought about either by circumstances of internal scrutinies and external suggestions. Each of the Agencies like the CSIR, AEC and ICAR has its own background and history of development and the evolution by trial and error of its structure as it exists today. The same is true of the laboratories. A study of the organisational structures of these Agencies and their laboratories in relation to their overall performance may enable one to adopt the more favourable elements of all of them. There is a growing tendency in the Agencies and their laboratories to do away with the hierarchical patterns and introduce more and more collegiate type of organisation. The existing patterns are, therefore, of an intermediate nature. But laboratories vary as regards the proportion of the two types. In all of them, however, research work is project-oriented. Each scientist

of the rank of Senior Technical Assistant and above is made the leader of a project with one or more associates. Each becomes by turn an associate in another project. Depending on the capability of a scientist, he may be the project leader of more than one projects, but, as indicated earlier (Paragraph 52.4.79) ordinarily there is a limit to the number of projects one can handle effectively either as a leader or an associate, howsoever competent he may be. We are, therefore, inclined to recommend that a scientist should not be attached to more than three projects whether as leader or as associate or both. The tendency of some overambitious scientists to try to grab leadership of too many projects should be deprecated.

52.7.16 According to the prevailing system, every scientist is entitled to submit research projects for consideration of the departmental/divisional research council, with the approval of which such projects are further scrutinised at the laboratory level. Each of the projects should have some bearing on the objectives of the laboratory. The laboratory may, under direction of the Agency, allocate problems and ask for projects from departments/divisions concerned. Project-oriented research pattern thus entitles a scientist to exercise his freedom within the limits of the objectives of a laboratory but at the same time makes him responsible for achieving the desired goal within a specified period and financial grant. This should not be interpreted as interference with his freedom. If, however, a scientist has got a bright idea, which does not even remotely conform to the

objectives of the laboratory, we suggest that either this should be taken up as a special case, or he may be offered facilities in another laboratory either of the same or of another Agency.

52.7.17 Functional autonomy is as much desirable at the project-team level as it is for the divisional and the laboratory levels. The control should come through work evaluation rather than the control of resources, e.g., financial and others. Each project-team is to work within a sanctioned budget and the leader has to account for the expenditure and progress of the project. Decentralisation and delegation of powers at suitable levels would greatly aid autonomous functions. We recommend that delegation of powers from the headquarters of the Agency to the Director of the laboratory and a similar delegation to the Head of a division/section are desirable features in a collegiate type of structure.

52.7.18 Given a decentralised system with appropriate delegation of powers, the heads of divisions/departments and the Director of a laboratory, the Board type of a management body may not be necessary. An executive council for the laboratory and divisional/departmental councils at that level would be sufficient. The idea of rotational heads for the laboratory as well as the division/department may not find favour in such circumstances. Instead, we are inclined to suggest that the director and ivisional/departmental heads may have the option to step out at the end of a tenure if they choose to join the rank of active scientists. The tenure should not exceed two terms of three years each, as suggested

earlier in paragraph 52.4.74 for the scientists at the ICAR headquarters.

52.7.19 Financing and budgetary system: The budgetary and financing process has remained almost as static in research laboratories as in the Government departments. As a result the intricacies are a bugbear to scientists, and as such a finance/accounts officer is a part and parcel of research institutes. However, there is ample scope of simplifying a budget preparation, by either working on the basis of a project or a project leader. Another drawback of the budget is its annual character, which restricts long-term planning of research projects. We recommend that at least a block grant or a rolling budget on a five year basis may be quite helpful so that money remaining unspent especially under equipment head in one year may be carried over to the next year. The control of expenditure of sanctioned budget for the laboratory should be entirely in the hands of the Director, and similarly for divisions and even projects in the hands of the heads and project leaders respectively.

52.7.20 Infrastructure: The important physical facilities of a laboratory include (a) library and (b) equipment. Apart from important books and journals the library should have a central documentation and information centre. Since foreign exchange is involved cautious choice should be used to select books and journals. Those that may be used only once in a while may not be purchased at all. Perhaps they are available in other institutes and universities from where they may be obtained on loan, or the relevant papers may be

duplicated. Such a procedure is, of course, much less costly in the case of journals than books.

52.7.21 Research is becoming so much dependent on sophisticated and costly equipment, most of which are imported that a good part of the nonrecurring budget has to be set apart for them. The requirement of foreign exchange is another constraint. Maintenance of many of these equipment which are not normally tropicalised is costly, because of the airconditioning facilities required for their upkeep. Maintenance is better if the equipment are handled by trained technicians and are provided with those spare parts which are likely to go out of order. To economise on equipment another procedure suggested earlier in paragraph 52.4.82, viz., pooling of equipment in a laboratory, is worth consideration. At no stage of training the scientists are, except in one or two institutes, exposed to the discipline of the workshop. They have either been used to push-button equipment, or assisted by mechanics. Unless some workshop practice is inculcated in them they will not have the aptitude for designing and fabricating equipment. We are of the view that every teaching institution and research institute should be provided with workshop training and the practice of designing and fabricating equipment. This training will stand a scientist in good stead and may inspire him in a well equipped workshop to take to designing and fabricating equipment for his own research work. In several countries, the laboratory is the birthplace of all sophisticated apparatuses. A similar attitude and aptitude should be developed in this country, if it has to be tolerably selfreliant in the matter of equipment. A few instrumentation

laboratories may not create the climate for self-reliance but workshop training in colleges, universities and institutes will do this gradually. While these issues are of general interest in any scientific laboratory including that connected with agriculture, there are certain specific issues in which agricultural scientists may be more legitimately interested.

52.7.22 Research agencies versus administrative authorities: The relationships of research agencies vis a vis laboratories with (a) the Government departments; (b) similar other agencies and laboratories, and (c) end users are very crucial. Their pros and cons have to be discussed impersonally and with an unbiased outlook, keeping in mind the interest of the country alone. The relative advantages of being an autonomous body vis a vis a fullfledged Government department have been argued in favour of the former. But it is known that even an autonomous research organisation which enjoys governmental grants is subject to governmentral controls and rules and regulations. They are autonomous only in name. Being remote, in the sense that the governmental control is operated through Government nominees in various capacities and having no linkage with or influence on Government decision making bodies, the Agencies and the their research laboratories find themselves in a dilemmatic position. Consequently, the Agencies began in the seventies to think afresh for a way out. If the agencies become departments in the relevant Ministries headed by scientist-Secretaries, they become part of the Government decision-making bodies and hence can influence the latter in favour of their respective agencies. It is

to be expected that the scientist-Secretaries should not at any cost sacrifice science at the altar of bureaucracy. The technocrats should be able to evolve procedures to shortcircuit redtapism in decision-making and implementation. The desirability of such procedures was voiced by Bhabha (vide paragraph 52.7.6).

52.7.23 Being departments in the Ministry and subject to the same rules and regulations the official relationship between the Government and the institute is obvious. But at the laboratory level the collaborative efforts should be close and cut across official redtapism. The scientists belonging either to the same or different agencies should have scope for free exchange of ideas, expertise and facilities. We suggest that there should be some regular arrangements for scientists of one agency to work in another agency and derive mutual benefit. In view of the fact that such an exchange is often resisted within the same agency, that between different agencies may sound as a tall order. But unless such collaborative understanding and team work come forth, success of multidisciplinary research would remain a mere wish. Appropriate changes in personnel policies (such as benefits of past services etc) will be needed to facilitate the process. The National Committee on Science and Technology with the assistance the Department of Science and Technology should foster this idea through longterm collaborative programmes of research. The joint panels set up by the ICAR, ICSSR,* CSIR, ICMR are in the right

* Indian Council of Social Science Research

direction to foster collaborative understanding and team work between related research agencies.

52.7.24 In the broad field of agriculture the end users are the farmers. The transfer of research results and the communication of information to the farmers are achieved through the mechanism of extension. This has been elaborately dealt with in the Interim Report on SAARET and in the Chapter 54 on Extension and Chapter 62 on Administration. It has been emphasised in all of them that the contact of the research scientists with the end users of the results of their research has been loose. This leads to delay and often confusion, and, what is more harmful, a complacent attitude on the part of the research scientist. Again, since extension has been thought to be less important avocation, it has generally been related to the less enterprising scientists. The results are disastrous. The extension personnel cannot afford to be scientifically less equipped, and, therefore, provisions for their intensive training has been stressed in the Interim Report and the chapters mentioned above. It has also been emphasised that research scientists should be occasionally involved in extension work, so that they have first-hand knowledge of the difficulties, if any, of transference of research results to the field, and solve them right there. This two-way dialogue will benefit both the research worker and the farmer.

52.7.25 Freedom of scientific pursuit: The objectives set forth for most of the research institutes are mission

oriented. As such they have certain goals to achieve for which each scientist is required to formulate certain projects and see that they are implemented. The scope for creating new knowledge and for discovery is restricted. "Discovery is an intellectual creative pursuit that requires enthusiasm to survive inevitable wrong turns on the path to knowledge. The researcher must be free and encouraged to range far afield as he probes for understanding. Creative genius cannot prosper in an atmosphere of flow charts, directives and busy work that restrain such freedom of movement"[1]. Even though predominantly applied in nature, agricultural research has had its share of many discoveries in the fields of human health and quality of environment. A competent administrator should see that men capable of contributing to fundamental knowledge are given opportunity and freedom. Much of what they would do may not be justifiable according to the usual yardstick of benefit-cost ratio. It is in such cases and matters that decision-making has to be left to the scientists themselves. A scientist administrator would normally appreciate the value of a research programme which has a high scientific content but whose benefit-cost ratio cannot be easily projected. Experience shows that in directed research individual freedom of scientists may be suppressed, while accepting objectives of lower scientific quality. It may be accepted that directed

1 1972. Report of the Committee on Research Advisory to the USDA. Report on National Research Council, 1972, National Technical Information Service, US Dept. of Commerce.

research has to play an important role in agriculture, but at the same time it is to be recognised that "research originating in the minds of scientists" should form an Equally important component of the total research efforts.

52.7.26 Motivation and incentives: The most compelling motivation for a creative scientist is to discover, the joy of discovery and to be known to the world for it. But he does not stand in the way of sharing the benefits of his discovery with others. Altruism, except in rare cases, may take a second place. The proportion of creative scientists is rather small even in a scientifically developed country. A large bulk of scientists consist of persons who are trained to participate in the routine of very sophisticated work depending on the nature of the problem. They are capable of collecting information of the right kind and analyse it and make logical conclusions. There are others who can study the pros and cons of a problem and plan experiments to find a solution. Some are capable of repeating similar experiments on an analogous basis, assuming universality of application of certain scientific principles. All persons engaged in these different kinds of scientific pursuits are research workers and scientists. Not all are motivated in the same way. Scientific discoveries may not come in the way of all, but they are not the monopoly of any section of scientists. Any scientist with keen sense of analysis, critical attitude and open and nondogmatic mind may have a chance to discover. The motivation of those who take science and technology as a profession is somewhat narrow, being often limited to personal benefits. There is nothing wrong in this

attitude provided it does not clash with similar interests of others. Financial gain, social position and fame in the scientific world, especially amongst his peers, act as great incentives to a scientist. But nothing allures him more than a well equipped laboratory and farm facilities, a well equipped library and a free and quiet atmosphere to work These facilities cannot be assured for the mere asking or wishing. Even if the financial part is taken care of, they have to be created by dint of his own hard work and devotion, sacrificing temporary gains and comforts.

52.7.27 In the field of applied research, as in agriculture, the laboratory discovery, unless it finds its way to the farmer, is of no consequence. Because of defects in teaching, laboratory workers are prone to shy away from field work. As a result, a separate category of extension workers has to be created, which are supposed to translate the laboratory finding to field application. This dichotomy is expeditious in the sense that the laboratory researcher is spared the time to devote himself wholly to research. But because research is considered prestigious the posts of extension workers are filled up by second grade persons. It is often assumed, wrongly of course, that extension work does not require the sophisticated training of a laboratory scientist. As a result, extension work has suffered considerably and may continue to suffer similarly in future unless remedial action is taken. We do find that even though scientific results are ready for application the achievement in the field is marginal, and in some cases distinctly adverse. We recommend that on the one hand the status and prestige of extension workers are raised; on the other hand, the researchworker must compulsorily go to

the field and join hands with the extension workers and see that his research findings are properly applied. This presumed sacrifice on his part would be rewarding in the long run, because he is going to enrich himself with fresh ideas, either arising out of extension of his own research work, or by his experience to field problems. Some research workers are unwilling to face field situations themselves, lest their own findings are not confirmed. This attitude of doubt and fear are unbecoming of a scientist, and should be done away with.

British Scientific Service

52.7.28 Doubts have been expressed whether creation of the Agricultural Research Service and recruitment to the cadre by an open competitive examination are appropriate means for providing better job security, promotion prospects and assuring better scientific performance. The British experience as recounted by David Davies[1] is relevant in this connection and makes an illuminating reading. A brief mention of the development of Scientific Civil Service in Britain and its present position may not, therefore, be out of order. As early as 1941 A.V. Hill, Nobel Laureate physiologist, while commenting on Government scientific establishments wrote, "In many of the Departments of Government, notably those of the Defence Services .....the danger of stagnation and complacency exists." Similar remarks were made by several committees which studied the situation in the sixties. As late as 1972, Organisation for Economic Cooperation and Development (OECD) report pointed out that

1 1975, Danes David Nature London.

"job security may well transform agencies in the government sector into havens for second rate scientists who can be assured of making a career there." The formalised Scientific Civil Service came into being in 1946 as a result of the realisation after the second world war of increasing importance of science to national needs. The British service is wider in scope and operation than that in other countries. More than 100 departmental research establishments covering such diverse fields as road research, maintenance of physical standards, forensic science, meteorology, nuclear weapons, control of plant diseases are manned by Scientific Service personnel. A study of the number of scientists occupying different governmental positions reveals, according to Davies, "The typical British civil servant scientist, however, will not make the top eighty. He or she will have entered with a science degree at the age of 22. He or she will be promoted to Higher Scientific Officer in the late 20s to Senior Scientific Officer a few years later and to Principal Scientific Officer in the late 30s. The next step may not come at all for the 'typical' person; but in the 40s he (practically no shes now) could take on more administrative responsibility as a Senior Principal Scientific Officer." In the words of Davies again, "The lot of the civil servant scientists seems at first sight to be a much happier one than that of his colleague in industry or a university. Shielded from the short-term pressure to be productive and from the constant questioning and irreverence of the young, the civil servant can pursue a linear career

in which he gains seniority as he gains experience. But does the immense stability of Civil Service science act as a positive hindrance to using scientists' skills in the most effective way? Many would argue that the duties of the Civil Servant scientist are so different from those of other scientists that it is foolish to apply similar sorts of yardstick except in salary, of course. There is a lot in this - much of the scientific work is routine, and a large proportion of employees are engaged in routine laboratory and field work and neither have the qualifications for more, nor would seek broader horizons. But the sort of work called for in the name of research is likely to be every bit as demanding as industrial or university research and the problems to be solved generally much greater, either because they are complex and involve lots of people or because there is some element of a race, military or civil."

52.7.29 The most surprising of the British Scientific Service is the fact that during the period of "immense university expansion, an election (1964) based on harvesting the white heat of the technological revolution, a growing concern with environmental matters (calling for more governmental intervention), a decline in the popularity of science among students and a major economic crisis resulting in a great reduction in the recruiting of university staff," "the scientific civil service has remained stable in size. One of the consequences of this is a remarkably uniform age distribution of civil servant scientists." The

immobility of the profession is striking indeed. How does then the Service adapt to change and growth in particular? It is to be assumed that the scientific staff are called upon to do much more than they were doing earlier. This is hard to believe, because of the very fast growth of science and technology. The profile of the British Scientist Service shows clearly that nearly half were inducted before the transistor and digital computer were commonplace. To quote Davies again, "Industry recognises the ageing problem by moving most of its research and development staff on by the age of 35 (this is accepted both by the employer's and employeess side of the Civil Service). Academic life recognises it by the reverence it attaches to the graduate student and post-doctoral worker. The Civil Service is in a more difficult position because it can do so little about its more senior members and has no real mechanism by which its more junior members have to face the fact that they are not cut out for research and development after, say, a trial period of five years. True there are annual reviews such as every good employer carries out, but although there are some attractive carrots the stick of intellectual ridic le or dismissal is lacking."

52.7.30 To get rid of incompetent and undesirable persons the "golden handshake" is one way. The other is that of making the mobility concept really work. The resistence of scientists to the idea of mobility is strong, if not in theory, but in practice. Scientists in Service tend "to remain with science even when the relevance of their skills may wane." This is the dilemma, which prevents noncreative

scientists from being given either a "golden hand shake" or an administrative or executive position outside science.

Department of Agricultural Research and Education

52.7.31 After a detailed examination of the organisation, functions and powers of sister research agencies like the CSIR, ICMR, AEC, BARC, the Government have taken the decision to reorganise the ICAR incorporating as many good features as possible of the sister research agencies while keeping in focus the special needs of agricultural research in its relation to agricultural development and the centre-state relations in this regard. The reorganisation has been brought into effect from April 1, 1974. The basic objectives of the changes are to confer greater autonomy and flexibility to the ICAR in its operational and management procedures. A Department of Agricultural Research and Education (DARE) has been established in the Ministry of Agriculture and Irrigation to provide the ICAR with the requisite linkages with the Centre and State Government agencies and to deal with administrative aspects and international collaboration in agricultural research and education. The Director General of ICAR will be concurrently the Secretary to Government in the DARE. This Department is to be of small size. Wherever necessary senior scientific personnel of the ICAR will be given appropriate ex-officio status in the DARE. There will be complete integration of administrative and technical wings of both DARE and ICAR. A new personnel policy which does not involve continuous application for posts and frequent competition amongst

professional colleagues but which will be "scientist-centred" rather than "post centred" and in which each scientist advances in his career on the basis of assessment of his work by professional leaders has been introduced. The relevant procedures in operation in the BARC and the CSIR for direct recruitment at different levels in the scientific cadre have also been introduced. The pay scales of agricultural scientists have been brought at par with the pay scales of scientists in other sister Government and autonomous scientific organisations.

Agricultural Research Service

52.7.32 An Agricultural Research Cadre has been constituted in the Council. This will provide for optimum utilisation of available scientific manpower and for enabling the desired mobility of scientists from one position to another, from one institution to another and from one region to another, as may be required in the interest of agricultural research and education. The cadre will be common to the Council as a whole. While the initial constitution of the cadre will be made from those who are already in position, after proper assessment, the future requirements will be done by various methods.

i) initial induction through an All- India competitive examination and interview to be organised by the Council under the auspices of the Agricultural Scientists Recruitment Board (ASRB), followed by a two year training course;

ii) spotting of talented scientists with specialised background as may be needed to fill critical gaps in the Council's research programmes and offer of appointment with the approval of the ASRB;

iii) direct recruitment to Agricultural Research Service at all levels excepting the levels of initial induction to meet the gaps as identified in the process of man-power planning to be undertaken by the Council;

iv) appointment to the managerial posts on time-bound basis through advertisement and selection and provision for renewal of the terms of appointment;

v) invitations of eminent Indian scientists by the D.G., ICAR, with the concurrence of the ASRB and the approval of the Governing Body.

52.7.33 Candidates for initial induction should possess research experience and evidence of research capability. To attain this competence they should require at least a period of 4 to 5 years after the Master's degree. Accordingly the maximum age of the candidates should be raised to 26 years. The Council will have the following grades out of which grade I to grade IV will constitute the cadre;

I	Rs 550-900
II	Rs 700-1300
III	Rs 1100-1600
IV	Rs 1500-2000
V	Rs 1800-2250
VI	Rs 2000-2500
VII	Rs 2500-3000
VIII	Rs 3000(fixed)
IX	Rs 3500(fixed)

The scientists of grade IV may reach upto Grade IX depending on performance without being required to move into a managerial post on the basis of five year assessment. Realising that the strength of the ICAR lies in its institutes and All-India coordinated research projects, the quality of the programmes formulated by these institutes and projects and the speed and efficiency with which they are implemented, the new policies provide forgreater administrative and financial powers to be delegated to the institutes and

projects.. Once a programme has been approved and necessary funds allocated by the Governing Body of the ICAR, the institutes will have the necessary authority to execute programmes with as little reference to ICAR headquarters as possible. This delegation of authority has also to proceed "down the line" in the Institutes. To ensure this. each institute of the Council will have a Management Committee with suitable representation of the scientific staff of the institute. With this arrangement the role of the ICAR headquarters is to be mainly in the area of performance audit and in assisting the conversion of research results into development programmes.

52.7.34 On the question of enabling the ICAR to contribute more effectively to the work of coordination and promotion of agricultural research in the country without involving itself unduly in the administrative morass of the institutes, two suggestions were mooted. First, to transfer the research institutes to the DARE, the Secretary of which shall take over the administrative management, while the D.G., ICAR shall coordinate the research work of the institutes, Second, to retain the status quo of the ICAR and DARE, but to create an additional body like the UGC to sanction grants to agricultural universities and do such other things, as the UGC does in respect of the general universities and in addition allocate funds for research activities of the ICAR institutes and other research organisations and individual researchers. This body may be called the Agricultural Commission for Research and Education.

52.7.35 In view of the fact that a major reorganisation has been brought about in the ICAR only recently, and the objective is to promote greater autonomy to the institutes, better scientific performance and coordination of research with performance audit, it is advisable to watch and evaluate over a period of time the impact of the reorganised system for effectively relating research and education to agricultural production instead of introducing at present any further changes in the system indicated in paragraph 52.7.31

Research Funding

52.7.36 Of the available financial sources utilised for agricultural research those of the ICAR, State plans, normal budgets or committed expenditure of the States and centrally sponsored schemes are the most important. Limited funds are available in the form of bilateral and international aids. Most of the researches sponsored by the above agencies are of an applied nature and of short duration. Funds for basic researches in agriculture required on long-term basis are limited. The ICAR, out of its cess funds, sanctions ad hoc schemes for 3 to 5 years to individual scientists and allot the full amount or a part of it depending on whether the investigator belongs to a university or any other institutions (paragraphs 52.4.14 and 52.6.1). Universities only in rare cases specifically allocate funds for research work of their scientific staff. The financing of agricultural research by State Governments is also negligible. For them outside sources are the only means to live a scientific life, even though uncertainly.

52.7.37 The research council of agricultural university and the adaptive research council of the State Government should identify the priority areas of basic and long-term applied researches which are of importance to the development of agriculture in the State and draw up relevant projects and programmes. The latter being of direct significance in agricultural development of the State, the State Government should finance them entirely. The two councils should jointly decide upon the more essential programmes and projects and allocate funds accordingly in case of financial constraints. The programmes and projects which go beyond the Plan periods should be transferred to the committed expenditure of the State agriculture budget, and the agricultural university should guarantee their continuity. This attitude and arrangement on the part of the State Government and the agricultural university would considerably allay the fear and doubts of research workers about the continuity of their scientific pursuit.

52.7.38 As a result of our visits to the agricultural universities and discussions we held with the Vice-Chancellors, Deans, Professors and other scientists, we have been convinced that the research base of the agricultural universities is extremely weak. Unless this base is appropriately strengthened one of the main purposes of setting up these universities will be defeated. To enable the universities to raise their scientific stature it would be necessary to put them into funds. We have indicated later in this section one way in which the State Governments may come to the help of agricultural universities. Even if such

assistance comes through the required strengthening of agricultural universities in respect of research would not be possible unless the Central Government comes to their rescue. Considering the importance of contributions the agricultural universities can make towards the upliftment of country's agriculture we are of the view that the Central Government should give such grants to agricultural universities as would enable them to establish solid research foundations. According to our estimate the Central assistance for strengthening research base in the agricultural universities for the Fifth Five Year period should not be less than Rs 50 crores. This amount should have to be increased in subsequent plan periods. As the different agricultural universities are, for several reasons, at various levels of research achievement it would not be desirable to grant them research funds on a pro rata basis. Instead, the grants should have to be determined by the individual requirements of agricultural universities so that all of them come up to a desired level. The assessment of requirements should be done by a committee of scientists. In our opinion the ICAR should constitute for this purpose a high level expert committee composed of the following:

i) Director General, ICAR.
ii) Chairman, UGC.
iii) Three outstanding research scientists belonging to nonagricultural disciplines.
iv) Three outstanding agricultural scientists not connected with the ICAR or the agricultural u universities.
v) Three scientist Vice-Chancellors of agricultural universities.

The members of the committee should be so chosen that they

The committee should have the option to associate in its work appropriate study teams for expert assistance.

52.7.39 About funding of research the ICAR has a special responsibility for which it receives the entire cess money levied on various agricultural commodities. One of ICAR's objectives being to promote agricultural research, it should identify with the help of experts (paragraph 52.4.13) gaps in knowledge and scope of research in relevant fields, and find institutions and scientists competent to take up the needed research work. Such of those gaps as are of all India importance should be the exclusive concern of the ICAR. Out of the cess funds it should fund research work of long or short durations under the auspices of universities or institutions wherever the right kind of scientists are available and the right kind of scientific climate prevails. Each agricultural university or a group of them, if necessary, should be assigned certain research responsibilities on the above basis and a fixed amount should be earmarked for conducting research work in the universities. This research work may be either sponsored as mentioned above or may emanate from the scientists at the individual level or as a team, and approved by experts appointed by the ICAR, e.g., the scientific panels.

52.7.40 There is a genuine difficulty on the part of universities to ensure continuity of the plan research programmes unless the State and the Centre give some sort of

guarantee about their intentions in regard to funds for research. To this end we recommended as follows in our Interim Report on SAARET:

"... for every Plan period the Centre and the States shall inform the university of the minimum level of funding that the university can expect for research from Plan funds annually during the Plan period. Funds will, of course, be made available on accepted programmes, but the sum total of such programmes shall not be less than the minimum accepted. Given the will, there is no doubt that a guarantee of a minimum at the level of 80 per cent of possible actuals can be given by both the States and the Centre. It should then be possible for the universities to plan the recruitment of their research personnel on a fairly long-term basis so that at least 80 per cent of such personnel have long-term contracts. The 20 per cent of the temporary posts that are unavoidable in any organised system, will take care of the fluctuations in the research programmes."

52.7.41 There is hardly any place of basic research schemes worth its name in the *ad hoc* schemes financed by the ICAR. This omission is perhaps due to the short-duration nature of *ad hoc* schemes. Owing to continued lack of encouragement, leadership in this particular category of research has not gained ground in agricultural universities. The basic sciences faculties in the agricultural university are generally too weak to sustain the desired leadership. This is a frustrating situation and we remarked about the

attendant problems in great detail in paragraphs 52.5.3-52.5.5. There we have made out a case that unless basic sciences get their due share of attention in agricultural universities, a deficiency is going to be created in the chain of research system, which would considerably weaken the research edifice. Apprehending this mishap in case attention is further delayed, we recommended strengthening of basic sciences in the agricultural universities by establishment of a number of professorial chairs (vide paragraph 52.5.6).

We have further said, "A strong centre of research can only be built around a scientist who has the qualities of leadership and, therefore, the creation of these chairs and the subjects chosen should depend on the identification of suitable field of research which the university is in a position to promote and the presence of an outstanding scientist, who can build up a tradition of research in the particular research field.

"By creating these Professorial Chairs and providing for sufficient research grants many of our talented scientists competent to carry out fundamental research can be attracted to join the agricultural universities. While a good number of these Chairs may carry a scale of pay of Professors available in the universities, a few may be created on a higher scale and designated as Chairs of Excellence to be offered to outstanding scientists who have earned recognition in the field of fundamental research in

agriculture or any discipline allied to it. These chairs may also be availed of to enable outstanding Indian scientists serving abroad to return and work in the country. It will also be useful to provide for Research Fellows, generally three to four in number, to work with each Professor in the designated subject."

52.7.42 The ICAR has accepted our view expressed above and the relevant recommendation, and has taken steps to implement it. The sooner the implementation is effective, the quicker would agricultural research be oriented in the right direction. The professorial chairs should be occupied by scientists of outstanding abilities. Great care is, therefore, needed in selecting them.

52.7.43 It is now recognised that agricultural research is one enterprise which has got a high pay off. Our impression is that where extension has failed the impact of scientific research has been minimal. Funding of research particularly in the universities and their research sub-stations should be more liberal than it is at present. Combined R&D funding in India is below even half per cent of the Gross National Product (GNP). This is too low in comparison with the more developed countries. We would suggest that in view of the important role of agriculture in Indian economy, R&D funding in the agriculture sector should be raised in a phased manner so that in ten years

or so it constitutes about 1 per cent of the contribution which the agriculture sector makes to the GNP.

8 SOME TOPICS FOR RESEARCH

52.8.1 Research is undertaken for acquiring knowledge, which is meant to be used for some useful purpose. When the particular knowledge is lacking, research is imperative. In other chapters of this Report wherever research is called for on specific topics suitable recommendations have been made. Whether in crops, animals, fishery or forestry, low productivity is a general phenomenon. Hence, the emphasis is on research which leads to higher productivity.

52.8.2 The research on crops of all kinds is hinged on the evolution of high yielding and short duration varieties. The general experience is that many of these varieties require large inputs of fertiliser, water, and pesticides. There being limits to the use of some of the inputs because of availability and fear of pollution, the search for such high yielding varieties may be sustained as a short-term measure to overcome immediate needs. In the larger interest and more stable economy varieties requiring intermediate doses of inputs, which can be spread over wider areas and be useful to a larger cross-section of farmers, would be more desirable. Many high yielding varieties require large amounts of water in a regulated manner. Rainfed agriculture can ill afford to ensure this condition. But it is rainfed agriculture which needs strengthening of research support in a big way. Crops tailored to fit the varied conditions of rainfed agriculture are what is urgently needed. Research work should, therefore, be geared to that end, namely dryfarming based on optimum water management. Of the crops

greater attention should be paid to those which have so far been neglected. They include pulses, oilseeds. coarse millets, fodder, medicinal plants, vegetables, fruits, to mention the most important ones. Research on export-oriented crops should be based on continuous market survey of demand, emphasis being on quality and sophistication. Improvement of livestock through crossbreeding, feeding and health cover should be the main research interest in the field of animal huabandry. Lopsided emphasis has been laid on animal health without simultaneous attention on production of improved animals. This imbalance has to be removed. Development of animal products technology should receive proper attention.

52.8.3 Mixed farming of the right kind seems to answer for the economic ailments and deficiencies of small and marginal farmers. Researches specifically directed to find the most profitable form of mixed farming based on available resources of land, water, men, animals and credit should be emphasised. Even after consolidation of holdings is done, cultivation and other farming operations are to be based on a suitable mix of animal and mechanical/electrical power. Researches on draught quality of animals would continue to be important. Research on agricultural implements and machinery should similarly be undertaken keeping small size farms in view.

52.8.4 The tendency to concentrate industries near urban areas for the sake of facilities and amenities has its attendant ills. If distributed in rural or semi-urban areas many of the latter can be prevented. Agriculture-based industries have additional advantages if spread over in a

rational manner. For this purpose, small scale or intermediate technologies should be developed through research. These refer not only to scale of operations but also to products of intermediate nature, which are amenable to less sophisticated processing. Not many developed countries would be in a position to furnish the knowhow on small scale intermediate technologies. Hence, reliance has to be exclusively on indigenous research. Export of raw instead of processed materials is less paying but is often forced because of lack of processing facilities. If suitable intermediate technologies are developed in this field, the foreign exchange earning would increase considerably.

52.8.5 Stress has been laid on researches relating to problems of small farms. But there are certain problems which cannot be profitably tackled in a piecemeal manner. They refer to command and catchment area development, soil and moisture conservation, land reclamation, etc. Each of these items requires an integrated approach to which the pertinent research work should be geared. A similar approach is called for in hill, desert and tribal area developments.

52.8.6 Any research on nutrition vis a vis. food habits should go hand in hand with or preceded by a thorough and systematic network of nutrition education.

52.8.7 In spite of alarming signals of pollution no worthwhile attempts are being made to recycle waste products of agriculture. Some of the real difficulties in the way of doing so would require intensive multidisciplinary research. But not being a sophisticated and prestigious topic, it is neglected. Waste utilisation is important not merely for preventing pollution but for supplementary plant nutrients.

52.8.8 Pollution by pesticides can be largely minimised by developing chemicals based on plant products which are easily biodegradable. The varied nature of tropical plants holds a great promise in this direction but research work worth mentioning is conspicuously absent.

52.8.9 In both waste utilisation and prevention of pollution microbiology plays a significant role. In fact, microbiology holds great promise in a country like India, because of tho favourable natural conditions for the growth and multiplication of microbes. Microbiological production on a large scale is possible of vitamins, proteins, fats, alcohols, organic acids, etc. which crops or animals elaborate in their systems. But the latter require land, whereas the microbes can do the same job without it. In a land hungry world microbial together with chemical technologies are being actively considered to supplement plant and animal sources. Moreover, these processes would be independent of weather and hence free from its vagaries.

52.8.10 Photosynthesis utilises solar radiation as its only source of energy. Researches on some of the unsolved problems of photosynthesis and on ways of making it more efficient are being actively pursued throughout the world. India being favourably disposed as regards solar energy should energetically participate in this pursuit, but there are not many who are showing interest in this type of research work. Algae, chlorella, bacteria, etc. are efficient converters of solar energy into useful products and should receive due attention.

52.8.11 The introduction of nitrogen fixing power to cereal crops through genetic manipulation is a fascinating field. It has an enormous possibility of being exploited as an easy and perhaps effective way of supplementing nitrogen need of these crops. Tissue culture is being actively pursued in other countries as well as in India. Greater and more intensive team work is what is required to achieve quick success in these fields.

52.8.12 In spite of rapid advance in science and technology of crop production we are so much dependent on weather. The study of weather and particularly the monsoon is, therefore, of utmost importance. The subject has been fully covered in Chapter 13, on climate and agriculture. We would like to emphasis that India should take the initiative and the fullest advantage of the resources e.g. stellites made available on an international level. For this purpose, the necessary infrastructure should be built up on a priority basis.

52.8.13 Root surface of plants is the active site where nutrients are taken up from the soil medium. But our knowledge about the function of roots is still rudimentary. Many questions of basic nature await answer. If known, they would greatly simplify the problem of fertilisation and manuring and water management.

9 SUMMARY OF RECOMMENDATIONS

52.9.1 The following is a summary of the important recommendations made in this Chapter.

1. Agricultural universities have generally not been able to undertake fundamental research so far. In the interest of agriculture, it is essential that they should pay immediate attention to this aspect.

(Paragraph 52.2.6)

2. There is an urgent need to encourage development of specialised centres of fundamental research in different parts of the country which would be capable of tackling problems that are basic in nature. The best places where such centres could be developed are naturally universities in general and the agricultural universities in particular. Central institutions of the ICAR are also places where such centres could be developed. One of the ways to encourage universities to develop such centres would be the setting up of professional chair by the ICAR.

(Paragraph 52.2.8)

3. Some of the State regional research stations should be placed at the disposal of the universities in such a manner that they have at least one such station for each type of climatic regions.

(Paragraph 52.2.9)

4. The State departments should confine themselves only to adaptive research such as varietal testing, fertiliser recommendation based on soil analysis, water

duties, etc. and must not use this freedom to develop parallel research organisation in competition with the universities.

(Paragraph 52.2.10)

5. There must be adaptive research council in Government departments similar to the research council obtaining in agricultural universities and in these councils the senior university experts should also find a place. The advice of these experts should be given full consideration in planning adaptive research programmes of the Government departments.

(Paragraph 52.2.11)

6. A system must be evolved in the State departments whereby research personnel have the experience of administration and extension work so that they have the necessary field experience to back up their research.

(Paragraph 52.2.12)

7. State experimental farms which are meant for demonstration work and for raising seeds etc. should be exclusively under the control of State departments, which can utilise them for adaptive research and extension work. But agricultural universities should not be precluded from using them.

(Paragraph 52.2.13)

8. The ICAR should, with the help of its scientific panels, undertake to draw up long-term plans of fundamental and applied research, identify gaps in information and assign them for execution to appropriate scientists, universities and research institutes.

(Paragraph 52.4.13)

9. In dealing with ad hoc schemes, the scientific Panels should make themselves more purposive and in this they should be provided with adequate administrative support from the concerned offices of the ICAR.

(Paragraph 52.4.14)

10. The agricultural and general universities, and especially the former are entitled to a larger share of research grants in those subjects in which they are still deficient. Attempts should be made to sponsor a large number of research schemes on those subjects.

(Paragraph 52.4.16)

11. The money available for ad hoc research schemes should be more and more diverted to universities and other research institutes wanting in research grants.

(Paragraph 52.4.17)

12. A fresh and critical examination of matters connected with ICAR publications is urgently called for. Much more imagination and drive would be necessary to give proper shape to this important objective of the ICAR.

(Paragraph 52.4.18)

13. The research activities in universities which are unable to finance from their own resources are on a low key. In spite of the increasing importance of co-ordinated projects the ad hoc research schemes coming especially from the universities should be liberally funded.

(Paragraph 52.4.28)

14. Co-ordinated programmes on research problems of both fundamental and applied nature in agriculture which are important from the national point of view should be sponsored by the ICAR. These programmes should be drawn up carefully after a review of the present status of research in that particular field and the gaps needed to be filled in.

(Paragraph 52.4.30)

15. The All-India co-ordinated research projects should broadly satisfy the following criteria:

i) the projects should envisage problem-oriented applied research of known knowledge under different broad agro-climatic conditions with marginal short-term basic research;

ii) the problems to be studied should be of national importance and they may belong to a single discipline or may be multi-disciplinary;

iii) problems should be such as to warrant the concentration of efforts of a number of scientists on a single problem, and

iv) the projects should aim at developing recommendations in the shortest time for increasing production.

(Paragraph 52.4.31)

16. Where it is necessary to carry on the relevant research at more than one centre, a coordinated programme, with appropriate arrangements for funds and coordination should be developed without the necessity of having a coordinated research project.

(Paragraph 52.4.32)

17. The ICAR should lay down the type of coordination suitable to the particular programmes under various schemes financed by it. All research work of local importance should be carried out by the agricultural universities and the

State ~~departments~~ through their own organisations and there may be no need for making any institutional arrangements by the ICAR for coordination for such work.

(Paragraph 52.4.33)

18. An important objective of these projects being to provide additionality and not to replace the research efforts already in hand it is reiterated the State Governments should not reduce the allocation for research ~~and~~ in their development plans.

(Paragraph 52.4.35)

19. A large part of the research work in agriculture should be conducted outside the purview of the coordinated projects under the coordinated and individual programmes.

(Paragraph 52.4.36)

20. The number of workshops should be reduced by suitably grouping together those of allied disciplines. In case of crops like rice, oilseeds, pulses etc. which are grown under diverse agroclimatic conditions. it would be appropriate to have zonal workshops.

(Paragraph 52.4.37)

21. As the workshop is the forum to consider the various problems arising from the researches carried out under the projects and as field acceptability is of great importance in the system of research, it would be desirable to associate the farmers, extension personnel, users and the industry also in the deliberation of the workshops at suitable interval so as to get a feel of the field problems.

(Paragraph 52.4.38)

22. The All-India coordinated research projects should include a provision of nonrecurring grant for construction of glass houses, laboratory facilities etc. This would enable locating the coordinating projects at different universities.

(Paragraph 52.4.39)

23. The following criteria for selection of locations for coordinated projects centres have been proposed:

i) importance of a crop or livestock species in the region and specific problems therein;

ii) existence of central research institutes/ agricultural university/experimental stations;

iii) quality of research staff already available in the institute/university/experimental stations etc. and availability of contact with high level scientists in various disciplines; and

iv) availability of facilities (land, irrigation, library, laboratory) at the institute/ university/experimental station etc.

(Paragraph 52.4.40)

24. The project coordinator should be a highly competent scientist in the field, possessing qualities of leadership. Mere length of service should not be the criterion for his selection; instead, the quality of his performance as also the capacity to coordinate the work of fellow scientists should be the major criteria.

(Paragraph 52.4.41)

25. A suggestion has been made that insofar as the post of project coordinator is concerned, other scientists in the project should be allowed to hold it by rotation. It is felt that it would be possible only in a coordinated programme and not the coordinated project. Such a rotation would be feasible in case of zonal Coordinators. At the

same time, we recommend that this may be tried in one or two projects on a trial basis and, if found successful be extended to other projects of long duration.

(Paragraph 52.4.42)

26. There should be continuous and rigorous assessment of each project. For this purpose, ICAR should develop a system of regular progress reporting on a quarterly basis. The progress reports should be scrutinised by the Project Coordinator. Unless the Coordinator certifies that the work is satisfactory, release of funds should not be made to that project. Further, there should be not only a regular financial audit, but also performance audit of each project, at regular intervals.

(Paragraph 52.4.44)

27. There should be a suitable system of adjustment through which savings on particular project centres or subcentres could be allowed to be utilised for other projects where progress has been quite significant. Foreign exchange needed for the import of essential equipment and livestock for various projects should be ensured.

(Paragraph 52.4.45)

28. Simpler and speedier procedures should be evolved for the sanctioning of the projects especially at the State department/agricultural university level. In addition to the necessity of some flexibility in the allocation of funds, there should be a small grant at the disposal of the project coordinator which could be utilised for unforeseen items of expenditure.

(Paragraph 52.4.46)

29. Large scale testing in our view forms part of applied research which should be taken up by the agricultural universities, Central research institutes on suitable problems of relevance to the areas in which they are located, in close coordination and collaboration with the development agencies. Funding and execution of research problems which are strictly of local nature should be the responsibility of the agricultural universities and State Governments.

(Paragraphs 52.4.48 and 52.4.49)

30. The tendency of establishing divisions on the basis of discipline and of expanding them by introducing limitless sections or units based on species has to be deprecated and stopped at an appropriate and manageable size of the divisons.

(Paragraph 52.4.57)

31. Research institutes should spread evenly over the different agroclimatic regions. For this purpose, they should preferably be of small and medium sizes having more specific and restricted objectives, so that manageability and viability are assured.

(Paragraph 52.4.58)

32. Posts of Directors of all the ICAR research institutes should carry the same scale of pay. The salary to be paid to a Director should, however, be in accordance with the merits of the person as a scientist, and be fixed by referring the matter to the body appointed to select him, irrespective of the status of the institute.

(Paragraph 52.4.61)

33. For the sake of better management of the institutes, the good institution, of achievement audit should be taken seriously and the recommendations made by the Committee be effective instruments of improvement.

(Paragraph 52.4.62)

34. Now that agricultural universities have been established in good number, the training courses in research should be installed in the universities only. The present tendency of research institutes to compete with the universities in awarding degrees will defeat the very purpose of the institutes, and should be done away with.

(Paragraph 52.4.65)

35. The institutes should refrain from any enterprise of large scale production and distribution of materials, e.g., of seeds (except breeder seed), fertilisers (including bacterial or algal cultures, biological products) etc. They should restrict themselves to the perfection of products of their research work, allowing outside agencies, preferably trained persons from the institutes/universities to commercialise the products.

(Paragraph 52.4.66)

36. Throughout each institute the spirit of expansion permeates. This defect has originated from the behaviour of the big institutes, and should be checked.

(Paragraph 52.4.68)

37. Those institutes/divisions which are below the 'critical' size should be strengthened and those above should

be allowed to be dispersed in the best possible manner, or redistributed with suitable administrative changes.

(Paragraph 52.4.70)

38. Realising the need of developing Animal Genetics in an integrated manner, an Institute for Animal Genetics should be set up. This institute may also deal with the discipline of animal reproduction.

(Paragraph 52.4.72)

39. The acceptance of the principle of technical assignments of the scientific staff at the ICAR head-quarters is in the right direction. We would strongly urge that the principle is rigidly followed, and no one should on any account be allowed to have more than two terms of three years each.

(Paragraph 52.4.74)

40. Facilities should be created for management training of personnel engaged in agricultural research and technology.

(Paragraph 52.4.75)

41. The staff research councils of research institute should encourage interdisciplinary research by sanctioning more funds for such projects.

(Paragraph 52.4.80)

42. For more efficient and effective utilisation of costly and sophisticated instruments the system of pooling the latter and appointing trained technicians to operate them should be encouraged.

(Paragraph 52.4.82)

43. In the matter of distribution of projects amongst researchers equity should be maintained in conformity with the ability of each of the research scientists, but in no circumstances should even a capable scientist be overburdened with responsibilities.

(Paragraph 52.4.84)

44. Each institute should have a competent publication section entrusted with the presentation, language, get up etc. of the publications.

(Paragraph 52.4.85)

45. In the choice of participants in conferences, seminars and symposia held either within the country or abroad the scientist who has made the major contribution should be preferred even though junior. The choice of a younger research worker is suggested in view of the fact that it would act as an incentive to him. Every scientist who is so selected to participate should be properly groomed, for which the senior scientists having experience should be held responsible.

(Paragraph 52.4.86)

46. It should be made obligatory on the part of all categories of research workers including the heads of divisions and institutes not to be away except under special circumstances, for more than one week or so from the headquarters for attending meetings, conferences, symposia etc.

(Paragraph 52.4.87)

47. Triplication of substations being out of question, the most feasible arrangement seems to be to put the substations of Central institutes under the control of agricultural universities, but making the facilities

available there to the Central institutes and the State Governments either for collaborative or for independent work.

(Paragraph 52.4.91)

48. The agricultural universities should take up, in their stride for carrying out research work, more and more of basic research related to agriculture, and formulation of such projects as part of their own research programmes.

(Paragraph 52.5.9)

49. Because of ready help received, complacency prevails which cuts at the root of self-reliance. The opposite has also happened, though rarely. Because of these possibilities all collaborations should be sought with proper caution and foresight.

(Paragraph 52.6.7)

50. All the scientists of a laboratory should be familiar with the agency's as well the nation's scientific and technological objectives and country's socioeconomic plans. They should also be apprised of the functions of the laboratory to further these objectives.

(Paragraph 52.7.9)

51. Once the projects are distributed and budgetary allocations made for each project, the scientists-in-charge should be independent of any financial control within the budgetary allocation. They should, however, be accountable for the progress achieved and the expenditure involved at the end of specified periods, which may ordinarily vary from one to five years.

(Paragraph 52.7.9)

52. Instead of a hierarchical system with defined functions and status and seniority consciousness, a collegiate system with appropriate freedom and responsibility and accountability is desirable in a laboratory.

(Paragraph 52.7.10)

53. There should not be any bar on an outstanding scientist getting a higher emolument than that of the head of the department to which the scientist belongs, or even higher than that of the Director.

(Paragraph 52.7.12)

54. Gradation of scientists into categories A to F, as, for instance, in the CSIR with overlapping scales of pay commends itself, in contrast to scales having well defined stages commensurate with status as in Government establishments.

(Paragraph 52.7.12)

55. The procedure for the evaluation of a research scientist on the basis of scrutiny of his self-assessment report is more objective and should be given a fair trial.

(Paragraph 52.7.13)

56. It is in the interest of the laboratory that its scientists are given opportunities to upgrade their knowledge by occasional training in advanced centres, attending conferences, and participating in seminars and symposia.

(Paragraph 52.7.14)

57. The writing of monographs, reviews and textbooks by competent scientists should be encouraged.

(Paragraph 52.7.14)

58. There should be arrangements to rotate administrative posts, so that after a lapse of 3 to 5 years a scientist may return to his research work.

(Paragraph 52.7.14)

59. A scientist should not be attached to more than three projects whether as leader or as associate or both.

(Paragraph 52.7.15)

60. If a scientist has got a bright idea, which does not even remotely conform to the objectives of the laboratory, either this should be taken up as a special case, or he may be offered facilities in another laboratory either of the same or of another agency.

(Paragraph 52.7.16)

61. Delegation of powers from the headquarters of the agency to the Director of the laboratory and a similar delegation to the head of a division/section are desirable features in a collegiate type of structure.

(Paragraph 52.7.17)

62. The Director and divisional/departmental heads may have the option to step out at the end of a tenure if they choose to join the rank of active scientists. The tenure should not exceed two terms of three years each at the ICAR headquarters.

(Paragraph 52.7.18)

63. At least a block grant or a rolling budget on a five year basis may be quite helpful so that money in one year may be carried over to the next year. The control of expenditure of sanctioned budget for the laboratory should be

entirely in the hands of the Director, and similarly for divisions and even projects in the hands of the heads and project leaders respectively.

(Paragraph 52.7.19)

64. Every teaching institution and research institute should be provided with workshop training and the practice of designing and fabricating equipment.

(Paragraph 52.7.21)

65. The scientists belonging to the same or different agencies should have scope for free exchange of ideas, expertise and facilities. There should be some regular arrangements for scientists of one agency to work in another agency and derive mutual benefit.

(Paragraph 52.7.23)

66. A competent administrator should see that men capable of contributing to fundamental knowledge are given opportunity and freedom. "Research originating in the minds of scientists" should form an equally important component of the total research effort.

(Paragraph 52.7.25)

67. On the one hand, the status and prestige of extension workers should be raised; on the other hand, the research worker must compulsorily go to the field and join hands with the extension workers and see that his research findings are properly applied.

(Paragraph 52.7.27)

68. For the initial induction the candidates for Agricultural Research Service should possess research experience and evidence of research capability. To attain this competence they should require at least a period of 4 to 5 years after the Master's degree. Maximum age of the candidates should, therefore, be raised to 28 years.

(Paragraph 52.7.32)

69. In view of the fact that a major reorganisation has been brought about in the ICAR only recently, the impact of the reorganised system should be watched and evaluated over a period of time before any further changes are introduced.

(Paragraph 52.7.35)

70. The research council of the agricultural university and the adaptive research council of the State Government should identify the priority areas of basic and long term applied researchers which are of importance to the development of agriculture in the State and draw up relevant projects and programmes. The latter being of the direct significance in agricultural development of the State, the State Government should finance them entirely. The two councils should jointly decide upon the more essential programmes and projects and allocate funds accordingly in case of financial constraints.

(Paragraph 52.7.37)

71. Considering the importance of contributions the agricultural universities can make towards the upliftment of country's agriculture, the Central Government should give such grants to the agricultural universities as would enable them to establish solid research foundations. As the different agricultural universities are at various levels of research

achievement it would not be desirable to grant them research funds on a pro rata basis. Instead, the grants should have to be determined by the individual requirements so that all the agricultural universities come up to a desired level.

(Paragraph 52.7.38)

72. One of ICAR's objective being to promote agricultural research, it should identify with the help of experts gaps in knowledge and scope of research in relevant fields, and find institutions and scientists competent to take up the needed research work.

(Paragraph 52.7.39)

73. For every plan period the Centre and the States shall inform the university of the minimum level of funding that the university can expect for research from plan funds annually during the plan period. Funds will, of course, be made available on accepted programmes, but the sum total of such programmes shall not be less than the minimum accepted. Given the will, there is no doubt that a guarantee of a minimum at the level of 80 per cent of possible actuals can be given by both the States and the Centre. It should then be possible for the universities to plan the recruitment of their research personnel on a fairly long term basis so that at least 80 per cent of such personnel have long term contracts. The 20 per cent of the temporary posts that are unavoidable in any organised system, will take care of the fluctuations in the research programmes.

(Paragraph 52.7.40)

74. A strong centre of research can only be built around a scientist who has the qualities of leadership and therefore, the creation of professorial chairs and the subjects chosen

should depend on the identification of suitable field of research which the university is in a position to promote and the presence of an outstanding scientist, who can build up a tradition of research in the particular research field.

(Paragraph 52.7.41)

75. By creating these professorial chairs and providing for sufficient research grants many of the talented scientists competent to carry out fundamental research can be attracted to join the agricultural universities. While a good number of these chairs may carry a scale of pay of Professors available in the universities, a few may be created on a higher scale and designated as Chairs of Excellence to be offered to outstanding scientists who have earned recognition in the field of fundamental research in agriculture or any discipline allied to it. These chairs may also be availed of to enable outstanding Indian scientists serving abroad to return and work in the country. It will also be useful to provide for research fellows, generally three to four in number, to work with each Professor in the designated subject.

(Paragraph 52.7.41)

76. In view of the important role of agriculture in Indian economy, R & D funding in the agriculture sector should be raised in a phased manner so that in ten years or so it constitutes about 1 per cent of the contribution which the agriculture sector makes to the GNP.

(Paragraph 52.7.43)

77. Future research efforts should be directed more specifically to:

i) varieties of improved crops requiring intermediate doses of inputs for optimisation of yield;

ii) dryfarming based on optimum water use;

iii) pulses, oilseeds, coarse millets, fodder, medicinal plants, vegetables and fruits:

iv) balanced emphasis on animal production, animal health and animal products technology;

v) mixed farming and use of a suitable mix of animal and mechanical/electrical power, keeping small size of farms in view;

vi) development of intermediate technologies;

vii) area development programmes;

viii) nutrition _vis a vis_ food habits.

ix) waste utilisation and recycling of wastes;

x) development of biodegradable plant protection chemicals based on plant products having pesticidal properties;

xi) microbiological synthesis of products as supplementary and complementary to chemical synthesis;

xii) increase in the efficiency of solar energy utilisation by means of photosynthetic process;

xiii) introduction of nitrogen fixing power into cereals through genetic manipulation and other means, and tissue culture;

xiv) study of monsoons; and

xv) study of plant roots and their functions.

(Paragraph 52.8.2 to 52.8.13)

APPENDIX 52.1

Paragraph 52.4.19

All India Coordinated Research Projects

(i) food crops

1. rice
2. wheat
3. barley
4. maize
5. sorghum
6. millets
7. pulses
8. forage crops

(ii) commercial crops

1. sugarcane
2. sugarbeet
3. cotton
4. jute
5. oilseeds
6. soyabean
7. tobacco

(iii) horticulture crops

1. fruits
2. tuber crops
3. potato
4. vegetables
5. medicinal and aromatic plants
6. floriculture
7. spices and cashewnut
8. coconut and arecanut

(iv) soils, agronomy and agricultural engineering

1. water management and soil salinity and new cropping pattern
2. use of saline water
3. water management in high rainfall areas and temperate
4. correlation of soil test with crop responses
5. micronutrient research
6. measurement evaluation and improvement of soil structure
7. microbiological decomoosition and recycling urban and rural wastes
8. dry farming research
9. agronomic research
10. operational research (including national demonstration and integrated pest control project).
11. research and development of farm machinery, implements, production of prototypes and their evaluation.
12. optimisation of ground water utilisation through open wells and pumps
13. energy requirements in IAP Programme
14. post harvest technology

(v) animal sciences

1. cattle breeding
2. buffalo breeding
3. sheep breeding
4. poultry breeding
5. goat breeding
6. pig breeding
7. agricultural by-products and industrial waste materials

8. specialised dairy farming (economics of milk production under intensive dairy farming conditions.

9. epidemiological studies on foot and mouth disease

(vi) Fisheries

1. composite culture of Indian and exotic fisheries and riverine fish seed production

2. propagation of air-breathing fishes in swamps

3. ecology and fisheries of fresh water reservoirs

4. utilisation of trash fish and transportation of fresh fish

5. brackish water fish farming

APPENDIX 52.2

Paragraph 52.4.50

ICAR Institutes

1. Indian Agricultural Research Institute, New Delhi-12 (1905) (IARI)

2. National Dairy Research Institute, Karnal (1955) (NDRI)

3. Central Inland Fisheries Research Institute, P.O.Barrackpore. (W.B.) (1947)(CIFRI)

4. Central Rice Research Institute, Cuttack-6 (Orissa) (1946)(CRRI)

5. Jute Agricultural Research Institute, Barrackpore(W.B.) (1948)(JARI)

6. Indian Institute of Horticultural Research, Bangalore, (Karnataka) (1967)(IIHR)

7. Jute Technological Research Laboratory, Calcutta-40 (W.B.) (1938)(JTRL)

8. Indian Lac Research Institute, Ranchi (Bihar) (1925) (ILRI)

9. Central Sheep & Wool Research Institute, Avikanagar, Malpura (Rajasthan). (1962) (CSWRI)

10. Cotton Technological Research Laboratory, Matunga, Bombay-19 (Maharashtra) (1924) (CTRL)

11. Indian Veterinary Research Institute, Izatnagar (U.P.) (1890) (IVRI)

12. Central Arid Zone Research Institute, Jodhpur (Rajasthan) (1957)(CAZRI)

13. Central Institute of Fisheries-Technology, Cochin-11 (Kerala) (1957)(CIFT)

14. Central Potato Research Institute, Simla (H.P.) (1949) (CPRI)

15. Central Plantation Crops Research Institute, Post Kudlu, Kasargod (Kerala)(1947). (CPCRI).

16. Central Soil Salinity Research Institute, Karnal (Haryana) (1969)(CSSRI)

17. Indian Grassland & Fodder Research Institute, Jhansi(U.P.) (1962) (IGFRI)

18. Central Tuber Crops Research Institute, Trivandrum-10 (Kerala) (1963) (CTCRI)

19. Institute of Agricultural Research Statistics, New Delhi-12 (1959) (IARS).

20. Sugarcane Breeding Institute, Coimbatore-7 (T.Nadu) (1912) (SBI)

21. Central Marine Fisheries Research Institute, Jyothi Buildings, Ernakulam, Cochin-11(Kerala)(CMFRI) (1947)

22. Indian Institute of Sugarcane Research, Rae-Bareli Road, Lucknow (U.P.) (1952). (IISR)

23. Central Tobacco Research Institute, Rajahmundry (A.P.) (CTRI). (1947)

24. Vivekananda Laboratory for Hill Agriculture, Almora (U.P.) (VL)

25. Directorate of All India Soil and Land Use Survey, Nagpur (Maharashtra) (AISLUS)

26. Central Soil and Water Conservation Research & Training Institute, Dehra Dun (U.P.) (1954) (CSWCRTI).

27. ICAR Research Complex, Shillong (Meghalaya).

New Institutes in the Fifth Plan

28. National Bureau of Plant Introduction.

29. Central Institute for Cotton Research, Nagpur.

30. Central Institute for Agricultural Engineering, Bhopal.

APPENDIX 52.3

Paragraph 52.4.64

Questionnaire

1. Objectives of the Institutes/Stations:
Have any changes in the objectives been made?
If so, by whom and what are the reasons?

2. Research Policy, if any, of the Institute.

3. Structure and organisation of the scientific departments; Divisions/Departments, their functions and brief accounts of them. Research Council membership, responsibilities and functions.

4. Planning and execution of research work:
Mechanism of identifying research problems.
How are problems allocated?
Methodology of execution in the laboratory and extension in the field.
Delegation of research responsibilities.

5. Categories of Research work: Basic, Applied and Adaptive.
State at least five outstanding achievements of the Institute in the different categories of research.
Projects which are in progress; Objectives and achievements so far. Schemes in hand including independent research work by scientists.
Mechanism of evaluation of research work done by scientists of all categories.

6. Interdepartmental/interdivisional and inter-institutional projects, if any.

7. Relationship with the Agricultural Universities, State Departments and other Universities in the region in the matter of collaboration and organisation of research work. Are State research problems in agriculture and allied subjects identified, and attended to by the Institute?

8. What are the regional research stations for ?
Are they relevant in the present context ?

9. Can they be transferred to the Agricultural University and/or State Departments?

What is the manageable size of a research institute/ Division/Department?
When is a new Departmet/Division to be created?

10. How is the integration of teaching, research and extension being implemented?

11. Are there any short-term training programmes, diploma or certificate courses? If so, what are they? To what extent are they useful? Should not these training centres be managed by the Agricultural Universities?

12. What facilities are available to the research staff for improvement of their qualifications?

13. What is the extent of participation of research scientists in conferences which are organised by international and national bodies and learned societies in India and abroad? What is the basis of selection of scientists to these conferences?

14. What are the usual number and frequency of meetings attended by the Director, Heads of Departments/ Divisions and other senior research staff?

15. Indicate the future trends in regard to:

Expansion of Departments/Divisions:

Creation of new Departments/Divisions/Disciplines:

Research plan for the next decade or so:

Abolition of old Departments/Sections and Amalgamation of disciplines in the light of past experience and performance.

16. What are the requirements for/difficulties/possibilities of modernising research in the Institute/Section?

General Remarks

1. Delegation of administrative powers by the Director/Heads of Department.

2. Do the research staff participate in decision-making in connection with the formulation and implementation of research projects? If so, what is the mechanism?

3. What are the categories of research workers?

4. Is there any policy/principle laid down for the recruitment, evaluation and promotion of research staff.

5. What is the educational programme of the Institute? What are the courses of study given and at what levels? What is the basis of selection of students for admission to the various courses of study?
   What are: a) systems of teaching
   b) systems of examination and assessment?

6. What student welfare measures have been organised?

7. Is there any attempt on the part of the Institute to arrange/negotiate placement of trained students? Is there a Placement Bureau?

8. What are the available Library facilities?

9. What are the research scholarships available in the Institute? What are the values and tenure of these scholarships and the basis of selecting candidates for them?

10. What are the costly instruments available? Is it advisable to pool these instruments for common use? What is the performance of these instruments? Are there workshop facilities for repair and adequate arrangements for maintenance of instruments?

11. What are the important equipments used for student's laboratories.

12. What is the amount of foreign exchange available for importing instruments and how easily is it available?

13. What is the process of buying equipments, chemicals etc? State briefly the organisation of the administrative staff and their relationship with the research staff.

14. Brief information regarding:

    a) residential accommodation
    b) schooling facilities
    c) marketing facilities
    d) recreation and social amenities.

15. What is the ratio of research staff to the non-research staff?

16. What is the educational plan for the next decade with reference to the introduction of new disciplines, new methodologies, abolition of old departments and amalgamation/separation of disciplines?

APPENDIX 52.4

Paragraph 52.5.1

Agricultural Universities

1. Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (U.P.)
2. Punjab Agricultural University, Ludhiana
3. University of Udaipur, Udaipur (Rajasthan).
4. Orissa University of Agriculture and Technology, Bhubaneswar (Orissa).
5. Andhra Pradesh Agricultural University, Rajendranagar, Hyderabad.
6. University of Agricultural Sciences, Hebbal, Bangalore-24.
7. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.
8. Bidhan Chandra Krishi Vishwa Vidyalaya, Haringhata, Kalyani (West Bengal).
9. Konkan Krishi Vidyapeeth, Dapoli (Maharashtra).
10. Mahatama Phule Krishi Vidyapeeth, Rahuri (Maharashtra).
11. Punjabrao Krishi Vidyapeeth, Akola (Maharashtra).
12. Assam Agricultural University, Jorhat-4.
13. Haryana Agricultural University, Hissar.
14. Rajendra Agricultural University, Dholi, Pusa (Bihar).
15. Kerala Agricultural University, Mannuthy (Kerala).
16. Himachal Pradesh University (Agricultural Complex), Simla.
17. Tamil Nadu Agricultural University, Coimbatore, (Tamil Nadu)
18. Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra).
19. Gujarat Agricultural University, Ahmedabad-4.
20. * Indian Agricultural Research Institute, New Delhi-12.

---

* 'Deemed' University.

21. Chander Shekar Azad University of Agriculture & Technology, Kanpur (U.P.).

22. Narendra Deva-Avam Prodyogik Vishwa Vidyalaya, Faizabad (U.P.)

APPENDIX 52.5

Paragraph 52.6.1

Organisations other than Agricultural Universities and ICAR Institutes engaged in Agricultural Research*.

1. Agra University, Agra
2. Aligarh Muslim University, Aligarh
3. Annamalai University, Annamalainagar.
4. Delhi University, Delhi
5. Banaras Hindu University, Varanasi.
6. Osmania University, Hyderabad
7. Kurukshetra University, Kurukshetra
8. Lucknow University, Lucknow.
9. Kanpur University, Kanpur
10. Punjab University, Chandigarh
11. Meerut University, Meerut.
12. University of Rajasthan, Jaipur.
13. Bombay University, Bombay.
14. Madras University, Madras.
15. Calcutta University, Calcutta.
16. Gorakhpur University, Gorakhpur.
17. Gujarat University, Ahmedabad.
18. Guru Nanak University, Amritsar.
19. Shri Venkateswara University, Tirupati.
20. Viswa-Bharati University, Santiniketan.
21. Burdwan University, Burdwan.
22. Sardar Patel University, Vallabh Vidyanagar.
23. J.K. University, Srinagar.
24. Allahabad University, Allahabad.

---

* The list does not claim to be exhaustive.

25. Allahabad Agricultural Institute, Allahabad.

26. Saurashtra University, Rajkot.

27. Gauhati University, Assam.

28. Victoria Jubilee Technical Institute, Matunga,

29. Central Leather Research Institute, Madras.

30. Haffkine Institute, Bombay.

31. Birla Institute of Technology & Science, Pilani.

32. Sheila Dhar Institute, Allahabad.

33. Bose Institute, Calcutta.

34. Indian Institute of Technology, Kharagpur.

35. Oil Technological Research Institute, Anantpur

36. Sri Ram Institute of Industrial Research, New Delhi.

37. Commonwealth Institute of Biological Control, Bangalore.

38. Harcourt Butler Technological Institute, Kanpur.

39. S.B. Garda College & B.P. Bria Science Institute, Navsari.

40. Kulbhaskar Ashram Degree College, Allahabad.

41. Bara Joint Cooperative Society Ltd., Kasirpur

42. Mehsana District Cooperative Milk Producers Union Ltd., Mehsana.

43. Maharashtra Association for the Cultivation of Science, Poona.

44. Agricultural Institute, American Arcot Mission, Katpadi.

45. National Dairy Development Board, Anand.

46. Gokhale Institute of Politics & Economics, Poona.

47. Indian Institute of Management, Ahmedabad.

48. Indian Statistical Institute, Calcutta.

49. Forest Research Institute, Dehra Dun.

50. Central Food Technological Research Institute, Mysore.
51. National Botanical Gardens, Lucknow.
52. Central Indian Medicinal Plants Organisation, Lucknow.
53. Regional Research Laboratory, Jammu.
54. Regional Research Laboratory, Jorhat.
55. Textile Industries Research Associations, Ahmedabad, Bombay, Coimbatore.
56. Silk and Art Silk Mills' Research Association, Bombay.
57. Tea Research Association, Calcutta.
58. Wool Research Association, Bombay.
59. Indian Jute Industries Research Association, Calcutta.
60. Fertiliser Corporation of India, Units at Sindri, Trombay, Durgapur.
61. Taraporevala Marine Biological Research Station, Bombay.
62. Nutrition Research Laboratories, Taranaka, Hyderabad.
63. K.P. Jayaswal Research Institute, Museum Buildings, Patna.
64. Agri-Horticultural Society of India, Calcutta.
65. Institute of Jute Technology, Calcutta.
66. Birbal Sahni Institute of Ralaeobotany, Lucknow.

सत्यमेव जयते

53

E D U C A T I O N

53

EDUCATION

1 INTRODUCTION

53.1.1 Education for agriculture broadly covers all formal education in the subject from the school to the university level and also informal and nonformal education meant for those who practise the avocation as well as for those who support it in various ways. Essentially, the worth of agricultural education has to be judged by its effectiveness as an instrument of national development. It should aim at fostering a sense of enquiry in every recipient regarding problems of agriculture and a desire to solve them. In other words, the goal is service to the farming community through integration of teaching, research and extension.

53.1.2 In this Chapter we discuss the system of agricultural education in three stages, i.e., (a) primary and secondary, (b) intermediate and vocational and (c) higher. The scope of each category of education together with the authorities competent to impart them are also discussed and suitable recommendations made.

53.1.3 Education and training in animal sciences and fisheries have been duscussed separately under Sections 7 and 8 of this Chapter. The details of forestry education have been provided in Chapter 46 on Forest Planning, Research and Education and the Interim Report on Forest Research and Education and hence they are not discussed in this Chapter.

2 BRIEF HISTORICAL DEVELOPMENT

53.2.1 Some activities in the field of agriculture received formal attention of the Government when in 1871 the Department of Revenue, Agriculture and Commerce was set up by the Government of India. This was followed by the formation of similar Departments of Agriculture in the Provinces. Organised instruction in agriculture at the university level was introduced in the beginning of the twentieth century when five agricultural colleges were established in 1907. These colleges, in the initial stages, were imparting diploma courses but later on were upgraded to impart degree courses. Fresh impetus and orientation were given to agriculture after the formation of the Imperial Council of Agricultural Research in 1929 as a result of the recommendation of the Royal Commission on Agriculture (RCA). Postgraduate instructions in agriculture were started around 1930. At the same time the Imperial Agricultural Research Institute and Imperial Veterinary Research Institute which were primarily established as research institutes started imparting postgraduate training in agriculture and animal sciences respectively. By 1947 the number of institutions offering degree courses in agriculture was 17 with an enrolment of about 1500 students. Like other academic programmes, agricultural education in the early stages resulted in producing graduates for employment by the Government. Some attempts were made to provide facilities in education for agriculture at the primary and secondary school levels through biased schools and agricultural high schools.

53.2.2 The University Education Commission in its report submitted in 1949 remarked that the country's position in regard to food was pathetic and stressed the lack of proper agricultural research and the training of suitable personnel at various levels for meeting the challenging problems posed by agriculture in the country. The Commission recommended the setting up of 'Rural Universities' to cater to the needs of agriculture in India like what the land grant colleges had done for America. Though this recommendation roused considerable interest in the country, no definite steps were taken towards implementing it.

53.2.3 The Government of India appointed a Joint Indo-American Team in 1954 to make a comparative study of the institutions dealing with agricultural education and research, in the United States and India and to make recommendations for their improvement. The Team submitted its report in 1955 and recommended inter alia adoption of the pattern of higher education as in land grant colleges of American universities of USA. This recommendation led to the establishment of agricultural universities. This Joint Team endorsed the recommendation of the University Education Commission regarding the establishment of rural universities. As a result of the recommendations of the first Indo-American Team, the then existing agricultural and veterinary colleges in India were brought in 1955 into sisterhood relationship with five Land Grants institutions of USA for technical assistance. In 1960 the first agricultural university modelled after the Land Grant Colleges of USA was set up in Uttar Pradesh at Pantnagar. The Government of India set up the second

Joint Indo-American Team to review the work that had been done as a result of the recommendations of the first Indo-American Team and to have specific proposals for the development of agricultural education in the Third Five Year Plan, i.e., 1961-66. This team submitted its recommendations in July 1960. It recommended, among others, that an agricultural education pattern with well defined objectives be developed to encampass agricultural teaching from the vocational schools (Manjri type*), the multipurpose high schools on through the college and university.

53.2.4 In 1963 an Agricultural Research Review Team which included experts from the USA, the UK and India, examined very thoroughly the problems involved in agricultural administration, research, education and extension. They assessed the action taken on the recommendations of the previous two Joint Indo-American Teams. The Team recommended that the Indian Council of Agricultural Research (ICAR) should be reconstituted. The recommendations, with such changes as were considered necessary, were accepted promptly by the Government of India. It quickly took the first step of reorganizing the ICAR into an effective central agency for coordinating, directing and promoting agricultural research and education in the whole country.

---

* The first one of its type was established in Poona district in 1947.

53.2.5 The Government of India set up in 1964 an Education Commission to advise on the national pattern of education and on the general principles and policies for the development of education at all stages and in all aspects. In its Report, the Commission stressed inter alia the importance of education for agriculture and recommended the establishment of at least one agricultural university in each State.

53.2.6 From the recommendations of the various previous commissions and committees it is observed that more stress has been laid on the development of higher education in agriculture than the primary, secondary and non-degree programmes of education. To carry out the messages of new agricultural technology to the field large numbers of technicians and skilled workers are needed at the lower level. This has become all the more necessary as modernization of agriculture is creating multifarious employment opportunities. This means future farmers must be better educated to understand and practise the new techniques. Moreover, parallel opportunities are arising in ancillary services required for modernized agriculture, which need personnel with proper education and training. Modernization of agriculture is a dynamic process which calls for flexible education/training system to prepare persons to handle emerging situations. All aspects of agricultural development cannot be covered under the formal education system which has certain limitations. Therefore, it will have to be supplemented or partly replaced by

nonformal education system at various levels to remedy the missing links and to upgrade knowledge and skills of learners. It is meant for all categories of persons irrespective of age, sex, occupation, and school/college going youth, school/college dropouts, persons engaged in various professions and practising farmers for whom literacy is a prerequisite. It has been repeatedly stressed by various commissions and committees that to accelerate modernization of agriculture the primary producers must be made literate and aware of the tremendous potentialities for increasing agricultural production through the application of science to agriculture.

3 PRIMARY AND SECONDARY LEVEL EDUCATION

53.3.1 The education at the primary level (class I - V) is to fulfil the constitutional directive contained in Article 45 of the Constitution that the state should strive to provide free and compulsory education for all children upto the age of 14 years. The standards of education given in the primary schools at present is unsatisfactory as it imparts little beyond literacy and some elementary knowledge in a few academic subjects. It is desirable at this stage of development in the country to have the type of education and training at primary and secondary levels which could include four main elements - observation, cooperative as well as individual action, reading and writing. So far the education at these levels has concentrated primarily on the last two elements. The first two elements could be introduced through agriculture.

Agriculture in Primary Schools

53.3.2 The University Education Commission was of the opinion that basic education should introduce children to all the chief issues and interests of living. It further suggested the establishment of a residence school village for postbasic education. In its opinion the rural secondary school should be a residence school with the pupils living in hostels or in such houses as would be suitable for good life. The main idea, among others, was that basic secondary school village as a rule would serve a group of villages and should be conveniently located with reference to them. The number of students in such a school having 30 to 60 acres (12.14 to 24.28 ha) of land should be about 150, who would not only profit

from their studies but learn a way of life together for the promotion of which they should be given practical work in farming, building, carpentry, cabinet making, house repairing, weaving, rural crafts, health and hygiene and other useful village work.

53.3.3 The Education Commission (1964-66) reported that with the development in many States of the concept of basic education with its emphasis on concurrent training in a craft, agriculture was introduced as one of the primary crafts in junior and senior basic schools, especially those located in rural areas. In Uttar Pradesh, for example, agriculture as the principal craft was introduced in 52,654 junior basic schools (upto class V) and in 2,538 senior basic schools (upto class VIII). In some other States also agriculture was introduced as the main craft in a considerable number of junior and senior basic schools. However, in Uttar Pradesh, no separate agriculture teacher was provided in the junior basic schools. This fact as well as other obvious reasons led the Education Commission (1964-66) to recommend that this kind of educational programme in the junior and senior basic schools be discontinued. It recommended that "All primary schools including also those situated in urban areas should give an agricultural orientation to their programmes. We do not intend by this recommendation to add to the academic burden. Indeed, we are convinced that this does not require a special agricultural course but only orienting existing courses in general science, biology, social studies, mathematics, etc. A similar orientation towards agriculture should be continued in the lower and higher secondary stages."

We agree with this recommendation and suggest that an attempt should be made to write and revise the text books on general science especially biological sciences of the existing courses in the school education system to give the desired agricultural orientation. The National Council of Educational Research and Training in consultation with the ICAR, should take the initiative in training the school teachers who have flair for writing such books and institute fellowships for the purpose. It should be a continuous activity.

53.3.4 The agricultural orientation in education that is needed is simply to create awareness of the problems of the farmer, to appreciate skills needed in farming and possibilities opened by science and technology including those of self-employment. Education in home science that is, the science of well being of the family. upto the middle school level could be so designed as to form a part of general science and also integrated with the other courses in the school curriculum. Family wellbeing includes management of the available resources, health, hygiene, food and nutrition and concerns every member of the family, Education in home science should form an integral part of the general education for all children upto the middle stage.

53.3.5 Agriculture is taught in junior and senior basic schools, general secondary schools and multipurpose schools at the primary and secondary levels. During 1973[1], there were in India 429,888 primary/junior basic schools,

1 1973. Educational Statistics at a glance, New Delhi Ministry of Education and Social Welfare, Government of India.

97,357 middle/ senior basic schools and 40,127 high/higher secondary schools with 63,193,358, 14,688,516 and 7,475,046 students on rolls respectively. At the primary level, agriculture has been introduced as one of the compulsory crafts in the junior and senior basic schools especially in rural areas. In a few general high/higher secondary schools in some states courses in agriculture are offered either to fulfil the requirements of introducing a rural craft or as one of the elective subjects to meet the requirements for matriculation.

53.3.6 The generally accepted objective of the primary education, as already explained earlier, is to impart general education for a period of 8 years for children in the age group of 6 to 11 years. But most of the children who pass through the primary school, particularly in rural areas, do not go in for further education. The result is that a great number of boys between 11 and 15 years finish their education at the primary level only and fall back on their family land, if any. If the farms are not attractive they may move, often in vain, towards the cities in search of work. To avoid this frustrating situation there is need for preparing these young people to stay on their farms and lead rural life. This could be achieved either by changing the school curriculum so that it has an orientation towards agricultural and other rural activities, or by introducing some kind of nonformal education. Of the traditional occupations in the rural economy agriculture is the most important. With future economic development, rural and cottage industries are likely to play an important role in the village economy. The children who are in the primary

schools today may enter the labour force at the age of 11 or 15 in some of these industries, and hence early education and training would stand them in good stead. There is a view that parents are often reluctant to send their children to primary schools as the studies there have little relevance to their traditional profession. They may be persuaded provided their children could get suitable training in, say, crop management, dairying, poultry, sheep and goat rearing, fishery, horticulture, etc. and some of the crafts required in rural areas. They may easily be components of nonformal education programmes. Through the introduction of such programmes the students would get the much desired work experience as recommended by the Education Commission (1964-66).

Agriculture in Secondary Schools

53.3.7 We have suggested that at the primary and high school level the existing curriculum should be oriented towards agriculture. This would mean that either the teachers of the primary schools should have training in agriculture or the extension staff at the village level may be deputed for the purpose. At the high school level the teacher should be a trained agricultural graduate. If a trained graduate is not available, one having similar qualification may be recruited on deputation from the Department of Agriculture.

53.3.8 On the recommendations of the Commission on Secondary Education set up by the Government of India in 1952, 503 multipurpose high/higher secondary schools were

established during 1955-57 on experimental basis in many States. By the end of 1960-61 their number increased to 2115. In these schools agriculture was offered as one of the streams in many States. The total curricular programme was based on a common core programme including a craft for all streams. The agriculture stream had two types of option, one academic in content (college preparatory) requiring science subjects, and the other more vocationally based (employment preparatory) which calls for practical agriculture, applied mathematics and applied science. Both groups were expected to take a common basic course in agriculture. This experiment of multipurpose schools with agriculture stream failed as these schools were ill-equipped and teachers were inadequately trained. Besides, the students who passed out of these schools were not considered suitable either for governmental jobs as middle level technicians or for higher studies.

Non-Formal Education

53.3.9 The formal education at the primary and secondary stages serves in reality only a minority of children and youth in the rural areas. A majority of out-of-school children and youth, farm women, illiterate persons engaged in various farming and other occupations are left out. But this is the section of rural people which deserves special consideration if their productive capacities are to be raised. For the literates the nonformal work experience programmes would be quite appropriate. For the illiterates other types of work experience programmes have to be thought of. These programmes should be so formulated that improvement of literacy through work experience finds proper place. Nonformal

programmes are particularly valuable for those who are already engaged in farm and allied occupations, because the latter would enable the participants to improve their knowledge and apply it gainfully. For those who have no occupation, nonformal programmes should be somewhat different, so that the participants are in a position either to fit into some developmental activities or find for themselves ways of self-employment.

4 NONDEGREE EDUCATION PROGRAMME

53.4.1 In the preceding paragraphs we have considered the need and potentiallty of agriculture-oriented general education at the primary and secondary levels as a kind of prevocational education. About 25 per cent of those who complete the high/higher secondary schools find opportunities for higher education in the general as well as professional universities. The rest are left out to take up odd jobs as they have not been prepared for any worthwhile occupations, and if they do not succeed in this, they swell the crowd of the unemployed. Most of such young men belong in particular, to the rural areas and have to depend on land and other rural occupations for their livelihood. But the present system of preuniversity education does not prepare them at all for this purpose. To make up this deficiency, nondegree educational programmes under which they may be trained as skilled workers and technicians seem to be the best. These programmes pertaining to agriculture should basically aim at the following:

i) developing an understanding and appreciation of farming as a respectable vocation;

ii) developing attitude, understanding and skills necessary for improved rural living;

iii) acquiring knowledge for managerial and manipulative skills in promoting agriculture and farm activities;

iv) stimulating desire, skills and appreciation for better home and family living; and

v) providing opportunities for gainful employment on the farms and self-employment as full-time progressive farmers.

53.4.2 The logical approach to categorise vocational education appears to be on the basis of level, degree and duration of studies needed, coupled with the background education of the candidates, and on the basis of employment openings. Taking these factors into consideration three broad categories seem to be called for namely, (a) lower level skilled workers, (b) middle level technicians and (c) higher level scientists and technologists. The term 'skilled worker' applies to persons who have received a vocational education and training in the exercise of a skill in a particular field. Functionaries at the skilled workers level are farm production operators, farm machinery operators, engine drivers, farm electricians, tractor operators, storage assistants, farm assistants, etc. The term 'technician' applies to persons working in occupations requiring elementary knowledge of technology and related sciences. Functionaries at the technicians' level are village level workers (VLWs), stockmen, fieldmen, water use and management technicians, refrigeration and cold storage technicians, veterinary compounders, etc. The term 'scientist/technologist' applies to persons having an advanced training in appropriate sciences and technologies in universities or equivalent institutions of higher education. The level of occupation covers such activities as research, development, organisation, planning, production, processing, storage, marketing etc. As mentioned in Section 5 of this Chapter, this level of education has been more carefully attended to and is much better organised. But very little attention has so far been given to educating the technicians and skilled workers. In reality, however, these intermediate level

workers are directly concerned with the application of new technologies into practice. Hence there is urgent need for organising sound vocational and technical training in agriculture through appropriate nondegree educational programmes.

53.4.3 Previous commissions and committees have gone into the question of vocational agricultural education and made recommendations to strengthen its infrastructure, but no effective steps have so far been taken. While formulating proposals for the Fourth Plan in 1966, the Education Panel of the Planning Commission planned to set up 2000 junior agricultural schools. These schools were presumably analogous to junior technical schools and aimed at training sons of farmers who were in a position to adopt improved farming practices. In fact, it was meant to produce not job seekers but self-employed better farmers. The Education Commission (1964-66) was of the view that the scheme could not be successfully implemented since such schools could not endow the trainees with the desired level of vocational competence.

53.4.4 Later, the Working Group on Agricultural Education/ Vocational Agricultural Education of the Planning Commission in its Report (1967) recommended that pilot projects on vocational agricultural education should be started in a phased manner starting from 1968-69. The ultimate aim of the programme was to establish farm boys as successful full-time self-employed farm operators and as responsible citizens. As the vocational agricultural education envisaged a close relationship between the student, his parents and the home farm, it was important to implement the programme as close to the homes of students as would permit their daily attendence.

This programme of vocational agricultural education was, however, not accepted by the ICAR for reasons given by the Education Commission (1964-66), namely, that these schools could not endow the trainees with the desired level of vocational competence. Instead, the idea of the establishment of agricultural polytechnics given by the Education Commission (1964-66) was preferred by the ICAR.

Deficiencies

53.4.5 Non-degree education programme planning is often done on an ad hoc basis almost as a direct and unadjusted transplantation of the Western system. Various types of non-degree educational programmes are being carried out by the governmental and non-governmental agencies. Most of the institutions attempt to train literate rural youth in scientific farming. But sufficient practical bias to prepare the trainees for independent farming is lacking. This is due to lack of adequate facilities and suitable staff. The existing institutions are equipped to train students for rural professions in government or semigovernment jobs but hardly suitable for self-employment and various occupational roles they are expected to play in the rural community.

53.4.6 Till 1972, up to which data have become available, the vocational education in agriculture was imparted in 74 agricultural schools, 6 rural institutes and a few veterinary and dairy science and craft training centres. The vocational or agricultural schools admit students after primary education and offer one to two years' certificate/diploma course. They are primarily meant to train sons of farmers who would go back to the land. But this objective is hardly realised.

Instead, the entrants look for lower field jobs in the State Departments, which are only too few. Most of them remain unemployed and render the training efforts infructuous.

53.4.7 Vocational agricultural education as at present organised has failed to step up modernisation of agriculture because of the wrong choice of age group of students, course content and timing of training. The schools are not equipped with the required facilities to impart training in scientific agriculture. The staff provided are too inadequate and not properly trained for teaching. Rural youth (12-25 years of age) are being placed in the normal educational system, the inadequacy and incompatibility of which for the rural setup and needs are too well known. The rural youth trained in this way turn towards cities for jobs instead of staying in the farm. This worsens, on the one hand, the problems of urban unemployment and congestion, and on the other, leaves the development of rural areas once again to the illiterate and the less educated farmers.

53.4.8 The trend in rural community of parents to allow their children to flee to cities and try for white collar jobs stems from two considerations: (a) farming is more strenuous and not unoften less rewarding, and (b) urban employment, whatever the remuneration, is more prestigious. It is no secret that few young men or women really select farming as their first choice for a life-long vocation, perhaps even fewer parents really want their children to be farmers or wives of farmers. We must, therefore, be realistic about this trend and every effort should be made to make farming socially more respectable and economically more attractive,

so that youngmen and women are attracted to farm life. The training programmes should at the same time take care that the youth gain confidence and imbibe the spirit of self-reliance. A lot depends on the quality of staff and amount of facilities available, and approach towards farming as an economic venture.

53.4.9 Schemes of vocational education are meant not merely for children of farmers who are well off. It should be available more easily to those of the small and marginal farmers who are hard pressed for land and require greater technological guidance to increase productivity. Some appropriate vocational courses of short duration may be introduced in the agricultural schools so that they could be availed of by them.

53.4.10 Non-degree institutional programme for women is very important. Whereas the educated youth may have a chance to earn his living in occupations other than agriculture, the girl in the rural household has substantially to depend upon her position in a farming community for her livelihood. Non-degree institutional programme is, therefore, all the more important to the rural educated girl.

Krishi Vigyan Kendras (KVK)

53.4.11 It is observed that agricultural education at the preuniversity level is much less developed than at the university level. Thus, while there are 10,000 seats available for admission to the degree level education, hardly 2,000 or so are there at the lower i.e. diploma/certificate level in 74 agricultural schools. The need, broadly speaking, is to have at least 3 agricultural

technicians trained in vocational programmes to one university trained agricultural graduate. The proportion of agricultural graduates to technicians appears to be too low in India compared with that of Japan and Taiwan which have 1 : 10 and 1 : 7 respectively. However, this proportion depends upon the stage of agricultural development in the country. The type of agricultural technicians would also depend on the stage of development and the degree of sophistication of technology introduced. The technicians vary in range from one occupation to another. They may belong to one of several such designations as field level advisers in the extension services and in agriculture credit organisations, field assistants in research institutes, farm managers, instructors of special short courses in vocational agricultural schools etc. The role of these middle level functionaries is becoming more and more important in the changing agricultural system. They may preferably be trained in the agricultural polytechnics. Keeping in view the central idea of agricultural polytechnics the ICAR put forward a revised formulation which is meant to attend to nonformal education and transference of technology through work experience, but not intended to train job seekers.

53.4.12 The objectives of the KVKs are as follows:

i) The KVKs must impart learning through work experience and hence will be concerned with technical literacy, the acquisition of which does not require as a precondition, the ability to read and write.

ii) The KVKs will impart training only to those extension workers who are already employed or to practising farmers and fishermen. In other words, the KVKs will cater to the needs of those who are already employed or self-employed.

iii) There will be no single syllabus and the precise programme of each KVK will be tailored according to the potential for agricultural growth in that particular area.

iv) Existing institutions will be examined for their suitability for being developed into KVKs. The underlying principle will be to introduce technology where dedication and a spirit of selfless service already exist, rather than try to establish a technological institution and then look for the other attributes which alone can make such an institution useful.

53.4.13 The scheme developed by the ICAR was to start by setting up five KVKs during the Fourth Five Year Plan period to be followed by, say, 50 by the end of the Fifth Plan. The five include a KVK each at the Indian Horticultural Research Institute, Chettalli (Karnataka), the National Dairy Research Institute (NDRI), Karnal (Haryana), the Agricultural Engineering Institute at the Raichur Campus of the University of Agricultural Sciences, Hebbal. (Karnataka), the ICAR Dryland Farming Centre, Himayatnagar (Andhra Pradesh) and the Tamil Nadu Agricultural University at Pondicherry, as a multipurpose KVK. The Pondicherry KVK started functioning from 1974. The other four are to be started in 1975. The five KVKs, according to information received from the ICAR, "are planned to be trainers' training centres in which the teachers of the 50 KVKs dealing with respective specialised activities will be trained". For the sake of expediency some of the KVKs for trainers' training may be associated with the research institutes but as a long term policy they should be attached only to the agricultural universities. Some of them may also be operated, in consultation with and with the approval of the State Government, by voluntary agencies having reputation for public service.

53.4.14 Each of the KVKs should have academic freedom to develop as enunciated in paragraph 53.4.12, its own programmes in conformity with the needs of the area in which it is situated. For this purpose, it would be advisable to consult local development authorities and seek their cooperation on matters concerning them. The training programmes should have to be need-based courses of short or long durations varying from a few weeks to a few months or longer, say, one or two years. These may be part-time and full-time education courses. Some of these, specially the long duration ones, may conveniently be correspondence courses for the practising farmers. Evaluation should be a built-in component of the KVK to review, revise and improve the courses in conformity with the need of the region, type of trainees and development programmes.

53.4.15 Tribal areas having a large percentage of drop outs at the primary/secondary levels need special attention. Some programmes of nonformal vocational education suitable for these people have to be formulated which would be in several respects different from the ordinary run. Only those who have knowledge of problems of the tribal areas and of the people should be entrusted with these programmes.

53.4.16 For the success of the programmes of vocational agricultural education a few conditions need to be satisfied. Learners attached to a production enterprise should be suitably remunerated. Educational facilities created should be linked with developmental programmes

and availability of job opening. As a follow up measure, the trainees not absorbed in jobs should be provided with loans and other facilities like marketing, extension and farm input services, as a step towards self-employment. In this way, trainees would serve as innovative farmers and set examples for others.

53.4.17 Vocational education is comparatively costly. Therefore, infrastructures of existing institutions should be utilised, as far as practicable, for this purpose. For the vocational courses meant for women trainees, women teachers should preferably be appointed. The success of vocational education programmes is pivoted on the availability of competent and devoted teachers. But the problem of recruitment of the right type of teachers cannot be solved easily. Suitable emolument is no doubt an important allurement and should be provided. At present some of the teachers are being trained in the teachers training colleges, but there the necessary orientation towards agriculture is usually limited, or even absent. Moreover, the trainee teachers do not possess sufficient past experince in farming or related trades. In the circumstances, it will be advisable to give preference to those who have graduated from polytechnics and vocational agricultural schools and have appreciable farm experience. These teachers could best be trained in polytechnics attached to the agricultural universities.

53.4.18 With a view to meeting the needs of development in agriculture and related activities, we should plan for each district to have ultimately one centre to provide for regular short duration training in agriculture and agro-industries. Such a centre may be a KVK. If any existing agricultural education institution has the potentiality, it should be developed into a KVK. We recommend that by 1985 each district should have at least one KVK and by 2000, at least 3 for each district. If this institution of the KVKs has to serve any useful purpose in modernising agriculture in the country and in creating an effective impact in the field of agriculture, the number of KVKs recommended by us is essential.

Linkages with Allied Agricultural Activities

53.4.19 As already emphasised the purpose of vocational agricultural education would be best served if the successful trainees get opportunities to utilise their training for self-employment and also to help implementation of on-going developmental programmes, such as national demonstration trials, farmers' training centres, farm information service, rural youth training programmes, VLW training programmes, agricultural schools, stockmen training centres etc. Every effort should be made to have proper coordination and integration between these and the vocational training programmes. Vocational agricultural training programmes can be started at those centres where these developmental activities are either in

existence or are likely to be started. Attempts at starting new institutions for the purpose should be discouraged. Preferably, the Gramsevak and Gramsevika training centres should serve as a nucleus for the vocational agricultural programmes. The centre with such a composite programme may constitute the KVK as has been mentioned earlier.

53.4.20 It is suggested that in all farm youth programmes, the development of rural leadership should be aimed at and encouraged, and for this purpose, a built-in system of awards or other forms of recognition should be used. There should also be ample opportunity and provision for continuation and development in academic skill and aptitudes, so that apart from ensuring a flow of skilled operatives for the agricultural services, the best and the most gifted students could continue their training at the higher level, some to qualify as agricultural scientists and researchers, others to specialise as teachers. In case they are not considered qualified to be admitted by agricultural universities deficiency courses to the extent necessary should be organised.

Organisation and Coordination

53.4.21 Coordination of nondegree agricultural education programme could best be ensured by an apex body consisting of representatives of the ICAR, Directorate of Extension, NCERT, Ministry of Education and Social Welfare, Ministry of Labour, Ministry of Health and Family Planning at the

Centre and selected technical heads at the State level. The ICAR and the Ministry of Education and Social Welfare should, after careful study of the pros and cons, develop programmes for middle level training.

53.4.22 The responsibility for follow-up activity, guiding, supporting and assisting the field activities in connection with youth programmes and developing nonformal educational activity at the block level should be that of the block authorities and, if necessary, an additional Agricultural Extension Officer (AEO), Animal Husbandry Extension Officer (AHEO) or a Fisheries Extension Officer, depending upon the nature and intensity of the field activities in a particular area, should be added to the block staff for this purpose.

5 UNIVERSITY LEVEL EDUCATION

53.5.1 Higher agricultural education has to be concerned with the education of qualified men and women who will occupy leading positions in scientific farming, shaping agricultural policy, agricultural research, in teaching, administration and a wide range of agricultural services and also in industries based on agriculture. In this context the content and quality of higher agricultural education will exercise a profound influence on all aspects of agricultural development.

53.5.2 The concept of establishment of agricultural universities took gradual shape. The brief history of development of higher education in agriculture has already been stated in paragraphs 53.2.1 to 53.2.5. By the end of 1975, the country had twenty one agricultural universities, which have been set up by Acts of legislatures of the States. In spite of the fact that the agricultural universities were set up on a Model Act of the ICAR and with almost similar financial assistance, the rates of their development vary a great deal. One very important factor has been the attitude of the State Government and Departments of Agriculture, Animal Husbandry etc. The other factor is the difference in age. The third, but not the least important, is the human factor, including the quality, dedication and devotion of the Vice-Chancellor, teachers and students. In the Interim Report on Some Aspects of Agricultural Research, Extension and Training(SAARET) we discussed at length the situation arising from the nature of relationship

between the agricultural universities and the State Governments *vis a vis* State Departments. So long as the relationships are not clear and close understanding and linkage are not established, the agricultural universities are not expected to perform satisfactorily. In addition to the agricultural universities, there are the Indian Agricultural Research Institute (IARI), the Indian Veterinary Research Institute (IVRI)and the National Dairy Research Institute(NDRI) which impart university level agricultural education. Of these three national institutes, the IARI is a 'deemed' university. There are, besides, 33 agricultural colleges (mostly in Uttar Pradesh) and 4 veterinary colleges which are either affiliated to general universities or are considered as constituent units. Of the agricultural colleges, 3 are constituent units and 30 run by private organisations. Three of the veterinary colleges are Government managed and one, i.e.,Madras Veterinary College is affiliated to the Tamil Nadu Agricultural University. Of the 30 research institutes under the control of the ICAR a number of them have M.Sc. and Ph.D. courses; one of them starts with the Bachelor's degree. Except the IARI, which has been recognised as a 'deemed' university, the rest have acquired recognition of one university or the other for conducting these courses. The desirability of the research institutes doing teaching work leading to academic degrees, which is the rightful function of agricultural universities has been discussed at great length in Chapter 52 on Research,with the recommendation that academic courses should gradually be withdrawn from research institutes and replaced by postdoctoral research work.

53.5.3 The growth[1] of colleges of agriculture, veterinary and agricultural engineering as well as of student population at different levels is graphically represented in Figs.1, 2, 3 & 4. Even a cursory look at the figures shows that the number of colleges has increased rapidly over the last 25 years. The number of students admitted increased rapidly until 1965-66 but has since declined in spite of the fact that the number of colleges has continued to increase. By the end of 1973 there were some 73 colleges offering degree courses in agriculture. Their number in 1951-52 was 19 with an annual intake of 1,060 but by the end of 1965-66, the number of such colleges was 70 with an intake of 10,049. The intake in 1972-73* came down to 6,560 in 71 colleges for which the data are available. The number of veterinary colleges in 1951-52 was 8 with an annual intake of 434 and by 1965-66 it went up to 20 with an annual intake of 1599. The total number of veterinary colleges was 23 in the country during 1973-74. The intake in 1972-73 came down to 1158 in 21 veterinary colleges for which the data are available. There has been similar rapid growth in the number of colleges offering postgraduate degrees in agriculture and veterinary sciences. But unlike the degree level the annual intake at the postgraduate level did not decline. The number of postgraduate colleges in agriculture in 1951-52 was 4, which increased to 49 in 1972-73. The annual intake of 6 colleges in 1955-56 was

1. 1975. Demand and Supply of Agricultural Technical Manpower. New Delhi. Ministry of Agriculture and Irrigation(Department of Agriculture), Government of India.

* Due to agitation in the States of Bihar and Andhra Pradesh, the admission during 1972-73 could not take place.

223 but it went up to 2002 in 1972-73. Similarly, the number of postgraduate colleges offering veterinary science was 1 in 1954-55, with an annual intake of 9, it went up to 21 in 1972-73 with an annual intake of 263. Insofar as agricultural engineering is concerned, till 1961, there were only two institutes offering degree course in it. The annual intake varied from 50 in 1958-59 to 65 in 1961-62. In 1966-67 the number of agricultural engineering colleges and annual intake were 6 and 329 respectively. By the end of 1972-73 the number increased to 10 with an annual intake of 399.

53.5.4 The expansion of agricultural education in the agricultural universities, data available for some of which are represented in Figs. 5 to 19, is rather uneven. Of the total number of agricultural colleges, about one-third are in Uttar Pradesh. In 1968-69, two out of every five candidates who were admitted and graduated were from this State. Next to Uttar Pradesh were Maharashtra and Rajasthan which accounted for two-thirds of the intake in 1968-69, the remaining one-third being from the other States. The annual outturn of the States like Orissa, Kerala and West Bengal does not seem to be adequate. The affiliated colleges are responsible in one way or the other for the large number of unemployed agricultural graduates. If we go through the live registers (vide also Figs. 5 to 19) of the employment exchanges, we find that there were 49 unemployed agricultural graduates in Andhra Pradesh in 1966-67 but at the end of 1970-71 their number increased to 1029. Similar trends are noticeable in the case of Uttar Pradesh and Maharashtra.

53.5.5 The position of total enrolment is somewhat as follows. Total enrolment of agricultural undergraduates during 1973-74* was 21,531 out of which 15,021 were in agricultural universities, 697 in the university teaching departments and/or constituent colleges of general universities and 5813 (including 589 in 2 affiliated colleges of Punjab Rao Krishi Vidyapeeth) were in affiliated colleges of general universities. The postgraduate enrolment in agriculture during the year was 4162 out of which 2652 were in agricultural universities, 109 in the IARI, 306 in university teaching departments and/or constituent colleges of general universities and 1,095 in affiliated colleges of general universities. In veterinary and animal science, the graduate enrolment during 1973-74 was 5411 out of which 4,707 were in agricultural universities and 1,451 in affiliated colleges of general universities.* The postgraduate enrolment in veterinary and animal sciences during the year was 559 out of which 506 were in agricultural universities and 53 in affiliated colleges of general universities, viz., Agra University.

53.5.6 A few general universities also offer post-graduate programmes in biological sciences which have bearing on agriculture, such as agricultural botany, agricultural zoology, agricultural chemistry etc.

---

* The figures, furnished by the University Grants Commission(Private Communication), are provisional.

Courses in agricultural engineering at the undergraduate and postgraduate levels are offered by seven agricultural universities, the Indian Institute of Technology(IIT), Kharagpur, and the Agricultural Institute affiliated to Allahabad University. In the area of teachers' training Punjab Agricultural University, Ludhiana has set up a department of agricultural education with a proposal for a degree in agricultural education while a few other agricultural universities are contemplating to do so.

53.5.7 Four schools of management outside the agricultural universities are conducting postgraduate diploma training in business management and administration as applied to agriculture. Punjab Agricultural University, Ludhiana, has already initiated a Masters' level training in this discipline, while a few others have similar proposals. The ICAR has decided to set up a national staff college to conduct courses in agricultural planning and administration for officers of the State and Central Governments and the scientific staff of the agricultural universities and research institutions. In the University of Agricultural Sciences, Hebbal it is proposed to establish an institute of agricultural administration and management for imparting training and conducting research work in research as well as development management. We have recommended in Chapter 62 on Administration the establishment of an Indian institute for agricultural administration and management for catering to the urgent need of management training in agriculture. We have also recommended in Chapter 52 on Research the establishment of an institute for research management.

Structure and Organisation of
the Agricultural University

53.5.8 The agricultural university has the goal of public service by way of supporting agricultural development of the State through the three-fold functions of teaching, research and extension education. The ICAR prepared a model Act in 1965-66 for agricultural universities. Some of them have adopted this Act with slight variations but there are some which maintain a different stand in respect of a number of important provisions like those relating to research, extension education and affiliation of colleges. There are at present 21 agricultural universities in the country and almost every State has one university though some States have more than one. A few more States are thinking of having more than one agricultural university. With the coming up of more and more agricultural universities the Act is getting modified and improved as a result of experience gained. In fact, such flexibility as would enable incorporation of modifications as and when occasion demands should be an essential feature of Acts dealing with a dynamic system like the university education. Conditions differ from State to State, and it may be advisable to permit flexibilities even within a State itself to try out different ideas and forms of management. The creation of more than one universities is likely to complicate the relationship between the state departments and the agricultural universities, in regard to the allocation of funds and

programmes of education, research and extension in the State. In order to avoid this difficulty, we recommend that there should be only one agricultural university in a State, having, if necessary, autonomous campuses in other suitable locations. Each of such campuses should have a Pro-Vice-Chancellor as its executive head, having the same powers in the campus as the Vice-Chancellor of the main university. All such campuses should be under one academic umbrella. The core courses in all the campuses including the main university would be the same, but the subsidiary courses may vary in each campus according to the agricultural needs of the delineated jurisdiction of the campus.

Board of Management

53.5.9 The agricultural universities have a more or less uniform organisational pattern. The highest executive body is commonly known as the Board of Management* but its composition varies. The membership ranges from 12 to 38. In some universities there is a body, called the Court of General Council which delegates administrative power to the Executive Council/Committee. The membership of the Court or General Council is usually large, and meets not more than twice a year. The Board of Management or the Executive Council meets as often as necessary, as it has to give guidance and directive to the academic and other bodies entrusted with the management of the university. The Board of Management as constituted in most

---

*Also called Board of Regents, Governing Body, Executive Council in different universities.

of the universities is often dominated by non-academic members. The nominees of State Governments and other universities do not find time to attend meetings partly because of lack of interest and partly because of their preoccupation. The Board of Management should have members who are committed to academic principles and would be prepared to give more of their time and experience for the development of the university.

53.5.10 The Board of Management and the Executive Committee are generally presided over by the Vice-Chancellor who is the highest executive of the university. Procedures for his appointment differ in different universities and none seems to follow the one laid down in the ICAR Model Act. The procedure in which the Board of Management or a similar body recommends a panel out of which the Chancellor has to select one has worked well, wherever it has been employed, and therefore, commends itself. The term of Vice-Chancellor varies from 3 to 5 years. So long as the chosen Vice-Chancellor is a distinguished educationist preferably from the agricultural sciences and an eminent scholar commanding respect of the academic community and has adequate administrative experience, the procedure adopted for his selection may remain flexible. In no circumstances should pressure politics and sectoral thinking influence the selection. The appointed person should be guaranteed power and authority and conditions of service so that he can function without fear or favour of any quarters. We, however, notice that pressure is exerted sometimes in the selection of the Vice-Chancellor and on him when selected to influence his decision and action. This

is to be strongly deprecated.

53.5.11 Deans, Directors and Heads of Departments are specifically entrusted, somewhat differently in different universities, with the administration of academic programmes. They receive directives from the academic oouncil, which is a subordinate body to the board of management or the executive council. Each of the officials of a college has his own areas of administration but coordinated on top by the Deans. Academic Councils of different universities mostly consist of Deans of various faculties and postgraduate studies, Directors of Research, Extension, Instruction and Student Affairs, Heads of the Departments and in some cases all the teachers upto the rank of associate professor or reader. The Vice-Chancellor is the Chairman of the Academic Council. It works through committees in all facets of the academic life of the institution. It is desirable to induct academicians and research scientists from outside the University to the academic council and to other important bodies of the universities like the research and extension councils. The faculty or the college receives directives from the Academic Council and is administered by the Dean as its Chairman. All the members of the teaching staff are generally members of the faculty or college council.

Autonomy of Universities

53.5.12 Academic freedom or autonomy is provided in the statutes but, while academic freedom can be sustained, that of the universities is greatly diluted. in practice owing to

inevitable dependence on State and Central Governments for financial assistance. There are indirect and indivious ways in which autonomy is jeopardised, so that the Vice-Chancellors or the academic bodies are not in a position to prevent occasional unsavoury compromises.

Growth of Agricultural Universities

53.5.13 From 1960, when the Uttar Pradesh Agriculture University* was set up, to 1968, no less than ten agricultural universities began to function. The rapid growth of establishment of agricultural universities may be seen from the graph in Fig. 20. Kalyani and Udaipur universities were established in 1960 and 1962 respectively but with a different setup, although predominantly agricultural in nature. By the end of September 1975, 21 agricultural universities and one institution deemed to be university such as IARI are functioning in the country. At the end of 1967 when eight agricultural universities functioned for a period of more than three years, it appeared to some of the Vice-Chancellors that it was appropriate to form an Association of the agricultural universities. The Association which came into existence in November 1967, provides a forum for discussion of mutual problems and for finding their solutions. The subjects that come up for discussion are of varied range e.g. academic, financial, administrative and other matters affecting the development of the agricultural universities.

---

* Now renamed as G.B. Pant University of Agriculture and Technology.

Colleges

53.5.14 In the ICAR Model Act, there is a provision that all agricultural colleges of other institutions coming under the jurisdiction and authority of the agricultural university shall become constituent units of the university but no unit shall be recognised as an affiliated unit. There is another provision that with respect to teaching at the university or college level in the field of agriculture, the territorial jurisdiction of the university shall extend to the entire State. As far as the University Acts of GB Pant, Tamil Nadu and Udaipur agricultural universities are concerned, they are not in conformity with the Model Act in respect of these two provisions. As a result, problems have arisen as regards streamlining agricultural education, research and extension education in these States. Some typical examples may be cited. The MB College has been made a constituent college of Udaipur University but the former continues to follow its own academic programmes and by virtue of sheer strength of student enrolment and teaching staff, the college is free to go its own way as it has an overwhelming representation in the controlling bodies. The Madras Veterinary College has recently been affiliated to Tamil Nadu Agricultural University instead of being a constituent college. There are agricultural colleges in some States (e.g. Uttar Pradesh) which would not make the required grade as constituent units of the university because of lack of minimum resources of staff, laboratory, land and animals. By making them constituent units, the

standard of agricultural education would be lowered. They should, therefore, be scrapped and prevented from swelling the roll of unemployed agricultural graduates. There has been some thinking of amending University Acts to permit affiliation, instead of making agricultural colleges as constituent units. But even in the case of affiliation the problem of maintaining standard of education would remain. Substandard colleges should, therefore, be abolished. Instead, the agricultural universities may have their campuses in suitable agro-climatic regions of the State as constituent units. The substandard colleges may, however, be reorganised into KVKs or centres of vocational education.

53.5.15 In most of the universities, there are colleges of agriculture, animal science/veterinary medicine, agricultural engineering, home science, basic sciences and humanities and postgraduate studies. We have observed an unhealthy imbalance in the development of these colleges. A university is not expected to have all the colleges on the same high level, and in that sense an imbalance may develop, but it has to be seen that none of them is below a certain accepted level. Out of these five or six colleges, at least two or three should aim at attaining high reputation comparable with any college elsewhere. These colleges would not only raise the prestige of the university but also help in increasing academic standard of the other colleges in the same university and even of other universities.

Integration of Teaching,
Research and Extension Education

53.5.16 Many research workers view teaching as a distraction and according to them any arbitrary allotment of time between research and teaching as a uniform standard for everyone should not be made. In the agricultural university, they opine, there should be place for the research worker who spends all his time on research, for the teacher who spends all his time on teaching and for those who are interested in doing both and who are able to let one activity complement the other. A subject matter department or discipline should have all this in its composition. There is no point in insisting that a teacher who is not interested in doing research, engage himself in some trivial project just because it can be said that he is carrying on research. However, experience has shown that almost all those who teach would like to engage themselves in meaningful research. There is also the obvious advantage in having the teachers engaged in research by way of what he does in his class. It provides a built-in mechanism for bringing to the students the realism and stimulation which comes from investigations and provides for them the same function which extension workers should perform for the farmers and the trainers of farmers. This is the situation in which each person in the department/division has inculcated in himself the spirit of integration of teaching, research and extension education. The idea should logically be extended to the department/division as a unit for the

process of integration. The organisation and working of the department should be such that the capabilities of its staff are employed to the best advantage by its head for teaching, research and in extending the technical information available in the department to those who have to put this into practice. This is what is meant by the integration of teaching, research and extension education.

53.5.17 It has been observed that among the agricultural universities, there is wide variation in the understanding and the concept of integration of the three functions, and in developing the structure and organisation within the university in bringing about this integration. Several universities have kept the teaching and research staff and their activities separate from each other. A number of them are still in the process of structuring their extension education activities. The subject matter department is to be recognised as the ultimate unit at the level of which integration of the three functions is to be ensured. The staff concerned with the teaching of the subject, those dealing with research in the area of the subject and those dealing with extending the knowledge of the subject matter to the field extension workers and farmers have all to be recognised as academic staff members of equal rank within the department and under the technical control of the head of the department, though for purposes of co-ordination, the Directors of Research and Extension exercise their jurisdiction over the respective staff in the departments.

The head of the department has to be squarely responsible for equipping his department with the scientific manpower and facilities for discharging the three main functions within the subject matter area of the department. The Dean of the faculty/college, who is incharge of teaching, Director of Research and Director of Extension should be jointly responsible for an integrated function of the three activities within the overall purview of the subject matter areas represented by the college or the faculty.

Students Participation in University Administration

53.5.18 In the background of political, economic and sociological changes occurring in various parts of the world and in this country in which the student community has been intimately concerned, the participation of students in university affairs has assumed great importance. It is, therefore, pertinent to discuss this point in its proper perspective. A Committee of the University Grants Commission (UGC) deliberating on this issue unequivocally recommended the inclusion of student representatives in administrative and academic bodies of the university. The students themselves expressed their views on this matter by saying that their representatives would refrain from participating in those discussions which pertain to examinations, appointments of teachers and any other confidential matters that directly concern them. Some of the universities have accepted the spirit of the UGC recommendations and have allowed student representatives to be in the administrative and academic bodies. One or two

agricultural universities have provided for student representations, others have doubted the wisdom of such a step, and a majority of them have suggested alternative ways of accommodating students' representation. These alternative ways take the form of joint consultative bodies, campus council, student advisory body etc. We are of the view that inclusion of student representatives with limited participation is the best possible means of getting across students' ideas in the administration of universities in which they are the most vital and important constituent. By involving the student community in the affairs of the university the general climate of the university will improve.

Student Services

53.5.19 It is needless to emphasise that universities should provide adequately for student welfare. Students' services are not merely a welfare activity but constitute an integral part of education. These activities include orientation of new entrants, health services, residential facilities, organisation of student activities, financial aid, guidance and counselling including vocational placement.

53.5.20 By tradition, a university degree is expected to lead to a safe job. But this tradition has no relevance in the agricultural universities. The latter have to continuously explore several ways for employment of the graduates in areas other than government services including self-employment. For this not only a certain degree of practical competence is necessary, but also a continuing touch with the developments

in their field for good service, progress and survival. The universities should, therefore, provide not only the needed practical training as a part of the curriculum but also some well planned activities of learning by doing, aimed at creating competence and confidence. Programmes can be drawn up in several other areas of production like seeds, crops, vegetables, poultry, piggery, sheep, dairy farming and fisheries and those of custom service with agricultural implements and machinery, fertilisers and water management, pesticides etc. These programmes should facilitate arrangements for students to earn while they learn. To ensure the above activities for students, it is necessary to have an organization of student welfare and services. Some of the agricultural universities have already moved in this direction and it is an activity that needs to be improved upon and strengthened.

Academic Programmes

53.5.21 At present in most of the agricultural universities the broad academic programme consists of (a) crop production, (b) animal production,(c) veterinary sciences,(d) agricultural economics and social sciences, (e) agricultural engineering, (f) home science including nutrition, (g) natural sciences and humanities,(h) research in various related fields and (i) communication. Recently, some universities have started offering programmes in forestry, fishery, horticulture, food science and technology, soil science and water management, agricultural meteorology etc. which reflect the current trends in

diversification and specialisation. The minimum academic programmes in an agricultural university with varying emphasis and appropriate diversifications should consist of (a) crop production, (b) animal production, (c) veterinary science,(d) agricultural economics and social sciences, (e) agricultural engineering,(f) home science including nutrition, (g) natural sciences and humanities, (h) communication and (i)agricultural meteorology.

53.5.22 In regard to fulfilling the objectives of the first degree programme in agricultural universities, we have examined several views expressed on the subject. At present, in almost all the universities, the practice is that the electives are taken in the final year of the degree course. It is important to distinguish between the electives, i.e., optional subjects taken in the closing stages of a broadly based first degree course and a truly specialised first degree. The former system is becoming popular in relation to the needs of the time and has much to commend it from the point of view of sound educational practices. The truly specialised first degree is probably of less value and its use should be increasingly restricted. Specialization should be introduced cautiously in relation to the stage of development of the agricultural economy and employment potentiality of the country. In the present stage of agricultural development in India, the major manpower need is for scientifically trained production-oriented graduates rather than for skilled specialists in the

sciences at the bachelor's degree level. Such specialisation should be undertaken at the postgraduate level. We, therefore, recommend the development of undergraduate curricula with a core component emphasising fundamental principles with ability to solve problems as they arise, with electives in production-oriented areas like crop production, farm management, farm machinery and power, soil and water conservation, agricultural communication etc. After the graduation stage, where some specific specialised programmes become necessary, they may be offered as short-term courses tailored to the needs.

53.5.23 We strongly support the recommendations of the Education Commission (1964-66)" that for the next few years, the principal task of the agricultural Universities would be to provide high level undergraduate education[1]". This recommendation holds good even today. The universities should strengthen and improve the programme for the bachelor's degree in agriculture, agricultural engineering and home science keeping the above guidelines in view. The requirements of animal sciences education and how they can be met are discussed in detail in Section 7. A minimum amount of animal science courses should be available to students of agriculture; similarly, animal production and veterinary science should have a minimum number of courses in human nutrition. Where demand exists, degree programmes in agricultural engineering should be started. However, some essential agricultural engineering courses should be available to all students for the degree in agriculture. Bachelor's degree programme in home science is recommended

---

1 Paragraph 44.23 pp 647

to be started after ensuring that a good base in home science extension work in rural areas has been established by the agricultural university to attract a sufficient number of girls from the rural areas to such a programme in order to provide manpower in this area.

53.5.24 It is recognised that women play a key role in agricultural production practices in villages. It is also recognised that female education has received scant attention in the agricultural education system. The home science programmes in agricultural universities should direct greater attention to the training of women. They should be trained for employment in extension work, community development work, processing industries, administration, nutrition and home economics research and teaching, not only in home science and nutrition subjects but also in those related to crop and animal production. Reference may be made to Chapter 54 on Extension in regard to the organisation of womens' training in various kinds of extension work.

53.5.25 The duration of study should be the equivalent of four years of academic work after 10 + 2 school education for agriculture and home science bachelor's degree and 5 years for agricultural engineering degrees. As may be seen in Section 7 the duration of bachelors degree in animal science is over 4 years plus internship for suitable periods. A similar view has been expressed in regard to fisheries education, details of which are given in Section 8 of this Chapter.

53.5.26 Where opportunities for employment exist, undergraduate degree programmes in horticulture, animal husbandry, forestry, fisheries and teacher training in agriculture may be taken up after developing suitable facilities. The undergraduate degree programmes should provide for certain core subjects which are regarded as fundamental and some elective courses in special fields more relevant to employment needs including self-employment. Valuable recommendations are made on the structure and organisation of curricula and course work for degree programmes at the annual conventions of agricultural universities. Such studies and reviews reflect the experiences of different agricultural universities in the field of agricultural education. As such useful guidelines emerge at these conventions on the norms for requirements of staff, field and laboratory facilities and libraries for ensuring minimum standards. We suggest that the universities should take note of these guidelines in formulating their academic programmes and the infrastructure needed for implementing them.

53.5.27 The emphasis in undergraduate programmes should be primarily on production or husbandry or management, extension, supply and services. For this, it is necessary that the teaching is linked with actual farming practices. Every campus should provide, through well managed farms and production oriented enterprises, for several types of work experiences for students 'to learn by doing'. We have considered the pros and cons of internship training <u>vis a vis</u> inbuilt training of undergraduate students and are of the view that instead of prolonging the training period as it happens

in internship training, the practical training required for either self-employment or professional employment should be built into the course, except in cases where it is necessary as mentioned later on in this Chapter.

53.5.28 We do not advocate the starting of bachelor's degree programmes in basic sciences and humanities in agricultural universities as the needs of the country are fully met by general universities. Postgraduate programmes in selected disciplines which will provide the necessary support to advance research work in agriculture may be taken up. We suggest as illustration, physiology, ecology, biochemistry, microbiology, statistics, biophysics, meteorology and such other areas which are of relevance to the disciplines common in agricultural universities. A few of the agricultural universities have already paid attention to the strengthening of some of these specialisations at the postgraduate level.

53.5.29 Postgraduate training leading to M.Sc and Ph.D. degrees should become a distinctive feature of agricultural universities. We have suggested in Chapter 52 on Research that the M.Sc. and Ph.D. courses should be gradually withdrawn from the ICAR research institutes. In that case the agricultural universities should diversify, strengthen and upgrade their M.Sc. and Ph.D. programme in order to prevent the occurrence of any void.

53.5.30 The agricultural services in the states need professional people who have not only technical training

in agriculture but also training in project formulation, feasibility study and evaluation, farm planning, marketing and pre-and post-harvest technology etc. It is, therefore, necessary that suitable programmes for short-term training are arranged in the university, so that students aspiring to have these specialised courses may avail of them.

53.5.31 We have come to know of trends in some of the agricultural universities for restricting admission to those ~~not~~ belonging to the region. At the undergraduate level the local or regional demands may outnumber available seats and in such cases the restriction is understandable. But this is not so at the postgraduate level, where similar restrictions are unnecessary and undesirable. In the matter of admission each university should be guided by (a) manpower needs, (b) availability of academic and other facilities ensuring standard and (c) usual criteria of eligibility. In admission to the undergraduate courses, preference may be given to (a) the meritorious boys coming out of Krishi Vigyan Kendras/vocational schools and (b) the field level functionaries with requisite academic qualifications and five years' experience.

Assessment of Students

53.5.32 Agricultural universities have broken new ground by introducing educational reforms such as larger number of working days 210-220 in a year, breaking up the academic year into two or three terms, i.e., semester or trimester, and replacing the set syllabi and external examination by syllabi

to be developed by the teachers themselves along with a system of internal and continuous evaluation by them. But the fairness of internal evaluation is often doubted with the result that the agricultural universities have not been uniformly effective in implementing the reforms. Consequently, compromises have been made in some of them. We believe that strict adherence to the essential ingredients of these innovations would bring back confidence. We suggest that periodical checks on the grading by the individual teachers/teaching departments are enforced for some time to come to remove the doubts about the fairness of internal evaluation.

Text Books

53.5.33 We have gone through the recommendations that have been made by several committees dealing with agricultural education and noted that lack of suitable text books and basic teaching materials is a serious weakness in effectually raising the standards of agricultural education at the higher level. The students rely mostly on lecture notes or on texts designed for students of temperate agriculture to supplement their studies. We strongly emphasise the need for the agricultural universities' staff including those of research and extension to accept, as a part of their academic responsibility the preparation of suitable text books. Text book writing schemes sponsored by publishers and by the Ministry of Education and Social Welfare and the ICAR should be fully utilised by the teachers. The ICAR should play the coordinating role in this respect so that text books

suited for different regions and covering different disciplines are produced by the agricultural universities as quickly as possible. Suitable incentives should be made available to the staff for undertaking this work.

Present State of Employment

53.5.34 There is a view that degrees should be delinked from employment. This would mean the employers may hold their own examinations for the purpose of selection. It would, however, be desirable for the universities and employing agencies to confer regarding modification of courses or introduction of new ones, keeping an eye on employment opportunities. The agricultural universities may also think of short-term courses to meet the needs of employers.

Employment Pattern of Agricultural Graduates

53.5.35 At present the Government Departments of Agriculture, Animal Husbandry/Sheep Husbandry and Veterinary, Community Development and Panchayati Raj, Co-operation, Fishery and Forestry etc. together with agricultural universities and educational and training institutions and research centres have been practically the sole employers of graduates/postgraduates in different disciplines of agriculture. Employment in private concerns and self-employment have been and still are at a low key. Though agricultural manpower is employed for the most part by the Central and State Governments, the actual number so utilised is not known. Only fragmentary information is available. The majority is of course engaged in extension

work at the block level, in administration and as technical officers (as subject matter specialists) at district and State levels. According to the provisional census figures (1971) of the percentage distribution of the employed agricultural graduate stock, out of the total degree holders and technical personnel in agriculture who are employed, a large proportion, i.e., 84 per cent is in the public sector, 12 per cent in private sector and the remaining 4 per cent is self-employed. Analysed according to employment status, the census figures show that 74 per cent of the agricultural graduates are in service, 3 per cent self-employed, 12 per cent unemployed and 11 per cent unspecified. More or less similar is the case of veterinary graduates.

53.5.36 By the end of 1973[1] the number of agricultural graduates including postgraduates was 10,000 on the employment exchange live register. As regards veterinarians, a surplus of 1,915 veterinary graduates and 600 postgraduates is estimated by the end of the Fourth Plan. From 1967 onwards the number of job-seekers has been increasing. The States in which the number of job seekers is over a thousand are Uttar Pradesh, Maharashtra and Andhra Pradesh. At present, the problem of unemployment is the consequence of the decline in creation of new positions by Government. Multiplication of universities/colleges, indiscriminate admission policy without considering the demand in different disciplines and sectors, imperfection in the labour market (employment system), limited growth of State and national

[1] 1975. Demand and Supply of Agricultural Technical Manpower, New Delhi. Ministry of Agriculture and Irrigation (Department of Agriculture), Government of India.

budgetary support for jobs in the public services, reluctance to finance public sector productive service through user fees or local assessments, limited vision on the part of agricultural graduates,lack of capital for self-employment are some of the reasons which are said to have created imbalance between demand and supply of agricultural graduates. Many new kinds of jobs may arise in the course of rapid agricultural development on transforming traditional agriculture into a new enterprise through application of science and technology. Promising fields for employment of agricultural personnel include (a) rural banking, (b) management of co-operative societies, (c) farm machinery and equipment supply and service, (d) the supply and marketing of inputs, such as fertilizers, pesticides and seeds, (e) food processing, preservation and marketing, (f)KVKs/ agricultural schools/farmers' training centres and self-employment.

53.5.37 To improve the employability of the trained personnel, it is recommended that the agricultural universities should (a) review skill and training requirements for specific jobs with appropriate State Government Department, (b) work with the State Government in the drafting of development schemes, (c) develop placement services, (d) develop preservice training with intervention for practical work, (e) develop refresher training/continuing training when employers find that education is deficient, and (f) encourage self-employment training programmes. It is

suggested that the ICAR should insist on the creation of an inter-university task group which would study the employment opportunities of agricultural graduates and formulate necessary action programmes. Specialised agencies such as the Institute of Applied Manpower Research and the Institute of Management should be consulted in the matter. The need for a continuing exercise on problems of unemployment and their solution is imperative.

Student Placement

53.5.38 The universities should organise an efficient placement service to provide a link between the graduates and their prospective employers. The university should publish a graduate directory giving the detailed information about academic as well as other background of students and bring it to the attention of prospective employers. Only a small number of universities are keeping full records of every alumnus and thereby acting as an employment or placement bureau. All the other universities should take similar actions.

Linkage with ICAR

53.5.39 The ICAR channelises financial assistance from the Centre to agricultural universities as well as to agricultural and veterinary colleges under the general universities and coordinates higher agricultural education and research programmes in the country. Further, the ICAR is responsible for maintaining standards of education

at the higher level, establishing collaboration with the foreign countries/agencies for advanced studies and researches, arranging exchange of scientists and publication and countrywide distribution of research findings and other relevant literature. The ICAR should ensure that (a) no university should, without adequate facilities, offer advanced courses of postgraduate education; (b) the admissions to postgraduate courses are kept open to aspiring graduates in pure sciences in which case necessary orientation courses in agriculture should be provided; and (c) a group of universities form, to the extent possible, a consortium for conducting postgraduate programmes in specialised areas so as to avoid duplication of costly efforts. To enable this, the universities must have a system of transfer of academic credits from one institution to the other.

Linkage with State Government

53.5.40 The State Agriculture, Animal Husbandry, Fisheries and allied Departments are the chief agencies with which the agricultural university has to develop durable linkages for accomplishing the common objectives of agricultural development in the State. The current situation in the country brings out that the relationship between the two is still not adequately defined and that a lot of confusion exists in regard to their relative roles. In view of the prevailing confusion, we dealt at great length in our Interim Report on SAARET to delineate areas of responsibilities

and of common interest in the fields of research, extension and training. Insofar as some of the training programmes of State Department officials and farmers are concerned the agricultural university and the State Departments should come to an understanding of each others' responsibilities. For the training of departmental personnel and farmers our recommendations are as follows:

(i) "A Joint Training Board may be constituted at the state level with members drawn from state departments and the agricultural university to formulate a comprehensive training programme for the State as a whole. An officer of the rank of atleast a Joint Director should be appointed to look after the training programmes and he should be the convenor of the Joint Training Board."

(ii) "The responsibility of periodical training of top and middle level administrators and experts of government departments should be that of the agricultural university. The duration of such training should be at least three months for an effective transfer of knowledge. State Departments themselves should arrange for the training of their lower level experts & administrators either through their own institutions or with the help of agricultural university according to needs. State Departments should also be responsible for routine training of field workers and farmers for new introductions and programmes, while the agricultural university should be responsible for either imparting training to farmers in general scientific agriculture or familiarising them in the latest developments in various disciplines. The frequency and duration of such training programmes should be determined according to need."

(iii) "The State departments should organise adequate training programmes in the district training centres for their junior staff members at the field level. The agricultural universities should organise refresher courses of long duration for departmental personnel."

Linkage with Input Industries

53.5.41 The agricultural university should develop linkages with agencies which supply the necessary inputs to agriculture. This should enable the university to produce the technical manpower required by these agencies, conduct inservice training for their staff, arrange for collaborative research projects, and get fellowships sponsored for training scientists according to demands of agencies. Some of these agencies are those dealing with credit, seed, fertilisers, irrigation, pesticides, animal feeds, vaccines and drugs, farm machinery etc., grading and marketing, preservation, storage, transportation etc.

Linkage with Manpower Planning Agencies

53.5.42 The agricultural university should work with the State manpower bodies so that manpower planning may be related both quantitatively and qualitatively to changing employment needs and opportunities. It would similarly be necessary to work with manpower cells of agencies in the private sector concerned with agriculture. We have already recommended the formation of a "placement" bureau in every university which should keep in touch with current and potential employers of agricultural graduates. Such a bureau would be able to provide valuable information for manpower planning.

Linkage with Research Institutions

53.5.43 The universities and research institute should come together and formulate training programmes and implement them jointly, with a clear understanding of purpose and complementarity. This kind of collaboration with research institutes and universities would be most

welcome not only for improving the usefulness and hence standard of university education but also for arming the State with adequately trained personnel for its developmental work.

Linkage with General Universities

53.5.44 Collaboration for improving the standard of postgraduate research should be fostered between the agricultural universities and general universities. The areas of common interest, out of which mutual benefit may be derived are, for instance, microbiology, analytical chemistry, biochemistry, ecology, biophysics, photochemistry, physiology, geography, geology, sociology, economics, engineering, meteorology, psychology and statistics.

Funding of Agricultural Universities

53.5.45 Apart from fees realised from regular students and trainees of short-term courses, the principal sources of finance of agricultural universities are the ICAR and the State Governments. Both these agencies should deal with the universities with understanding and imagination and place adequate financial resources at their disposal to enable them to carry out their obligation in an efficient manner. While definite safeguards are inevitable in financial matters and reasonable economy in expenditure has to be ensured, it is necessary to simplify rules and regulations and to operate them with speed and efficiency. The agricultural universities should also by their projects and programmes strive to attract financial support from non-governmental agencies which are involved in agricultural development and from private foundations which sponsor schemes of education and research. It would not be proper in the

best of university tradition to conduct any commercial enterprises as some of the universities may be doing for increasing financial resources. This would detract the universities from their legitimate functions.

Financial Assistance from State

53.5.46 The agricultural universities are established by Acts of State Legislature and are primarily designed to serve the agricultural interests of the States. Each of the latter, therefore, has to provide financial resources for the development and maintenance of its agricultural university. For a well regulated flow of financial support to the university we recommend the following measures:

(i) The State Government should fix block grants for the university making a practical and realistic assessment of requirements of the funds for efficient management of its programmes for a period of 5 years, giving complete freedom to the university to regulate the expenditure within the grant without any preconditions.

(ii) An automatic annual increase of 5-10 per cent in block grant should be allowed on the previous years' grant for normal rise in almost all the items of expenditure.

(iii) The State Government should be prepared to give matching grant and to take over the entire liability of educational and research programmes financed initially by the ICAR.

(iv) The ICAR gives financial assistance for the construction of college buildings, laboratory and library buildings and other physical facilities but does not provide any grant for their maintenance. The State Government should provide separate grant for the maintenance of all these facilities after they are completed, following State PWD norms.

(v) The State Government should provide sufficient 'foundation' grants for agricultural universities. The foundation grants will serve as a cushion till funds are released by the State or the ICAR on approved schemes

as there is generally a time lag in such releases due to procedural bottlenecks.

(vi) At present, in the plans the financial provision for education and research under the agricultural development programmes is inadequate. We recommend that 10-20 per cent of the total plan outlay under the agricultural development programmes should be earmarked in the State budget for agricultural education and research.

Central Assistance

53.5.47 According to the current procedure of the Government of India, any State Government desiring to establish a new university is required to send the proposal to the UGC. After the UGC has cleared the proposal, the ICAR takes necessary action for extending financial support to the proposed university as per norms in operation. The ICAR had appointed a committee of Vice-Chancellors of agricultural universities to suggest guidelines for the pattern of assistance to agricultural universities. The following are the suggested guidelines which have been examined by the ICAR Norms and Accreditation Committee:

(i) The pattern of assistance may not have any itemwise total ceiling. The allocation for each university should be worked out on the basis of the norms and criteria applicable to the university with due regard to the needs, potential for development, the stage of development already reached, population and area to be served, and other relevant factors.

(ii) The hill, desert and tribal regions may be given due consideration while fixing physical norms.

(iii) The assistance from the ICAR as well as from the State Government should be 100 per cent on the items which are to be supported by the respective agencies.

(iv) The agricultural universities should continue to be part of the centrally sponsored programme.

(v) While considering the case of assistance, the distinction between postgraduate and undergraduate education should be done away with. This would mean that additional academic staff of both undergraduate and postgraduate education should be financed by the ICAR on 100 per cent basis till these are taken over by the State at the end of the stipulated period.

(vi) Contingency expenditure should be provided by the State Government as per norms, taking into account the number of students, requirements of work etc.

(vii) Suitable Central assistance should be available to the university in the development of experimental stations at the university campus and also of regional research stations to meet the needs of agroclimatic regions in the State.

We endorse these suggestions.

6 PRESERVICE AND INSERVICE TRAINING

Importance of Preservice Training

53.6.1 Preservice training is meant to equip the individual to handle efficiently the job he has to perform. It may be of two types, first, professional training which one receives in the academic institutions through set syllabi and curricula; and the second, induction training which one receives after he is selected for the job. The two trainings are, in fact, complementary. Both these types of training should be so organised that they are open to necessary adjustments as and when the situation demands. In brief, this kind of training should be flexible, like any other form of education. The need for having suitable arrangements for inservice training which would enable the scientists and technicians working in agriculture and allied fields to update their knowledge has been well recognised. Inservice training is usually meant for functionaries who have been in position for 3 to 4 years.

Scope

53.6.2 As early as 1928, the Royal Commission on Agriculture (RCA) went into the question of inservice training while discussing agricultural education. Subsequently, the second Joint Indo-American Team, 1960, and the Education Commission (1964-66) recommended the organisation of inservice training for teachers in the form of summer institutes and special courses by the agricultural universities, and for raising the professional and technical competence of VLWs or Gram Sewaks and of technicians by the

agricultural polytechnics. Science and technology undergo rapid changes and therefore improvement in the efficiency of the functionaries, namely, scientists, extension workers and administrators participating in developmental programmes in agriculture would have to depend on a suitable built-in system for on-the-job training. In recent years, efforts have been made by agricultural universities and professional colleges to introduce greater practical bias in their educational curriculum. In some cases, provision has been made for internship. Even then a graduate while in service would require occasional training to handle emergent field problems. Hence, there is need for reinforcing his knowledge by inservice training at suitable intervals. The frequency and duration of such training would necessarily depend upon the background of the trainee and the nature of the courses to be covered.

Field Level Functionaries

53.6.3 In the early stages of Community Development Programme there was urgent demand for trained VLWs. In an attempt to train large numbers of them quality suffered at the initial stages. But the situation was retrieved at a later stage, when the Directorate of Extension of the Union Ministry of Agriculture and Irrigation in collaboration with the State Governments took up refresher training of VLWs by adding special wings to the existing extension training centres. The duration of the refresher courses is 2 months and till March 1974, 45,255 VLWs have been trained at 67 gramsevak training centres. These figures look quite impressive considering the total number of VLWs

who have so far received inservice training. However, a sizeable number of VLWs have not had the opportunity of this inservice training even once and at the same time there are others who have received it more than once. Additionally, some of the trained VLWs have been transferred to other departments, promoted or even retired. This creates a serious imbalance and anomaly in the situation. In view of the fast developing technology, such training should be imparted after an interval of every three years. However, in actual practice it takes nearly 8-10 years before these functionaries are recalled for such training. The main reason is lack of adequate facilities for refresher training and reluctance on the part of the employer to spare their field workers in the absence of any trainee reserve.

53.6.4 There are at present 25 Gramsevika training centres (GSTC) functioning all over the country. Earlier there were 46. The number got reduced as some of the States like Uttar Pradesh, Gujarat and Bihar closed down the centres. The number of the operating centres was also reduced by some States as the recruitment of Gramsevikas was stopped resulting in diminishing the need for preservice training of the Gramsevikas. The Gramsevika training centres are at present conducting mostly <u>ad hoc</u> training courses for associate women workers, farm women, rural young girls and the inservice training of Gramsevikas and Mukhyasevikas. Besides, a number of Gramsevika training centres has now been selected for conducting training of field functionaries under Integrated Child Development Service Programme of the Social Welfare Department. In the States

where the Gramsevika training centres have been closed down, the training of field functionaries of the applied nutrition blocks, which provide for two Gramsevikas and one Mukhyasevika, is still being conducted in the same Gramsevika training centres where some additional staff facilities have been provided for the purpose. The number of Gramsevikas and Mukhyasevikas trained in refresher course till 1974-75 is 5,946 and 1,088 respectively. The number of instructresses of Gramsevika training centres trained upto this period is 950. These centres are functioning under different State Departments like Agriculture, Community Development/Rural Development and Social Welfare. In many places training and field programmes of these functionaries are also controlled by separate departments. As a result, there is no uniformity in the job chart of the Gramsevikas and hence in the training content. In view of the important role that the rural women play in agriculture and home improvement the services of Gramsevikas are very essential to communicate the uptodate technical messages in this particular field to them. Closing down the Gramsevika training centres and shifting from the original concept of their functions indicate that State Governments are minimising the importance of this agency and giving low priority to the women's programme, which in our opinion is a retrograde step. In Chapters 9, 54 and 62, on Nutrition, Extension and Administration respectively, we have explained the need of the women's programme in rural areas and suggested how it should be implemented. In paragraphs 53.5.21 and 53.5.24

it has been mentioned that a home science college is an essential component of agricultural universities. We have also emphasised the home science programme in agricultural universities for training women for employment in various fields like extension work, community development work, processing industries, administration, nutrition, home economics, etc. In our opinion the development of educational infrastructure at middle and lower levels is vital for utilising the trained women coming out of the home science colleges of agricultural universities. In this context, we recommend that adequate number of Gramsevikas and Mukhyasevikas with proper training should be posted in the blocks. We further recommend that Gramsevikas training centres should be strengthened and those closed earlier should be revived. The programme of training Gramsevikas and Mukhyasevikas should be brought under the integrated Department of Agriculture.

53.6.5 The position in respect of other functionaries like agricultural Sub-Inspectors, Demonstrators, Fieldmen, etc. is still unsatisfactory as no systematic arrangement exists for their inservice training. Since the number of VLWs (men & women) and other functionaries at the village level is very large, all the Gramsevak training centres, agricultural schools and other similar training institutes should concurrently run inservice training courses for them. For this purpose the centres of training should be equipped with adequate qualified teachers and uptodate teaching materials.

53.6.6 Modern farming involves managerial skills for efficient use of land, labour, water and other necessary inputs; this requirement has to be met by posting a farm management specialist at each Gramsevak/Gramsevika training centre. We recognise that to impart adequate practical training to VLWs each Gramsevak training centre should be allotted not less than 20 hectares of land with reasonable irrigation facilities. It is, therefore, recommended that necessary steps should be taken to provide this facility at centres where they do not exist. Where new centres are to be put up, it would be desirable to locate them where seed farms are available so that it may be possible to link them up with seed farms which are not being properly utilised.

53.6.7 With the introduction of newer technologies in the field of agriculture, the extension workers are being called upon to render more specific and specialised technical advice to the farmers. In order to improve professional competence of VLWs, a one-year specialised practical training in agriculture and allied subjects is being imparted at selected training centres which have been upgraded for this purpose. In some States the duration of this training has been curtailed to six months with a view to increasing the coverage and economy on this account. This training is production oriented and practical in nature. Till March 1974, 14863 VLWs have undergone this training at 56 upgraded training centres. It was envisaged that the VLWs after completion of this training will be given suitable incentives in the form of

special pay, advance increments, selection grades and priority in promotion to the next higher position. While some of the States like Punjab and Madhya Pradesh have granted some of these benefits, others have not done so. As a result, the VLWs are not showing much interest to undergo this long duration training.

Training of Trainers

53.6.8 Noticing the deficiency of instructors of Gramsevak, Gramsevika and farmers' training centres and agricultural schools in extension methods and techniques, three extension education institutes have been set up on regional basis at Nilokheri (Haryana), Rajendra Nagar (Hyderabad, Andhra Pradesh) and Anand (Gujarat). They are primarily responsible for arranging two months' courses in extension methods and techniques of communication. Subsequently, these institutions have been assigned the responsibility of arranging courses for the extension officers and other field functionaries who are engaged directly or indirectly in agriculture production programmes. At these institutes, 73 courses including short-duration courses have been conducted for the benefit of instructional staff, 1,435 of whom have undergone training upto March 1974. It appears that not more than 50 per cent of the instructional staff of the Gramsevak and Gramsevika training centres, currently in position, have so far had the benefit of training. It would be desirable if each State Government draws up a phased programme for deputation of its staff for this training. For maintaining quality and imparting

uptodate knowledge to the trainees the agricultural universities should be suitably involved either by arranging for classes there or having university experts on short-term deputation to the training centres. A joint training board suitably represented by the relevant training institutions, faculties of universities and State Departments should formulate training programmes, organise the curricula and courses and set norms of evaluation of the trainees. The agricultural universities should be given the responsibility of the training programmes of the trainers.

Training of Extension Officers in Crop Production

53.6.9 The Extension Officers and other officers of equivalent rank at the block level such as Agricultural Inspectors, Agricultural Assistants, Assistant Development Officers, etc., are generally agricultural graduates who join the service after their initial training at the college level. In order to bring them uptodate with the latest technological development and to help them solve field problems the trainees should have a fairly broadbased knowledge of personnel management, preparation of schemes, planning of programmes, preparation of budget and accounting, and other office paraphernalia. A scheme for imparting refresher courses of one to two months' duration was started at selected agricultural colleges as early as 1954-55. Up to 1968, when this scheme was transferred to the State plan sector, the number of Extension Officers trained was practically equal to the number in position. It is likely that some of the Extension Officers were

deputed for this training more than once whereas others did not have even the first round of training. Statistical information regarding the number of functionaries operating at this level and how many of them have received inservice training is not available for the entire country. However, according to data received from Karnataka, out of 1,471 Extension Officers employed under soil conservation and development schemes, only 300 were imparted refresher training. In Maharashtra, out of 846 Extension Officers, this type of training was received by 117 only. It will be observed that the number of beneficiaries is small compared to the large body of functionaries in position. Nevertheless, no systematic arrangement has been made for the training of other functionaries who are performing similar duties as Extension Officers at the block level.

53.6.10 Inservice training has assumed considerable importance in the present context when extension officers are expected to provide more specific and specialised guidance to the VLWs and the farmers in the context of various production programmes. Considering that this training is to be repeated after every 3 years, to keep pace with modern technology, it is imperative that all the agricultural universities and colleges should develop appropriate training facilities for officials of all categories.

Courses for Senior Officers

53.6.11 In the face of rapid technological developments and having been too much occupied with administrative matters, senior officers at the divisional and higher

levels are occasionally required to refresh their knowledge. To meet this felt need, short-term courses of 7-10 days' duration are being organised by the Directorate of Extension at research institutes and agricultural universities throughout the country. Under this programme which started in 1966, 1,236 senior officers have been trained in 50 courses upto March, 1974. In the early years the number of such courses was 3-4 in a year. In 1972-73, 14 courses were organised in different crops and disciplines. But the States response to these courses is not encouraging. Maharashtra deputed 8 out of 52 and Kerala 2 out of 38 officers for the training since 1966-67. It appears that the courses are not interesting enough or the officers do not find them useful. There should be an evaluation of the staff courses and their deficiencies, if any, removed before they are offered to the officers.

Summer Institute in Agriculture

53.6.12 The summer institutes in the field of agriculture are being organised by the ICAR on the same pattern as those organised by the UGC in collaboration with selected colleges and agricultural universities and other institutions. The primary objectives of the summer institutes are: (a) to bring the participants uptodate with their subject-matter knowledge; and (b) to impart training in effective teaching methods and techniques. In each summer institute comprehensive training is imparted in a particular subject matter area. The duration of this training is 30 days and the participants

are drawn from the instructional staff of colleges and from the scientists working at the research institutes/farm/stations. This training programme was started in 1967 and upto the end of 1974, 65 summer institutes in agriculture have been organised in which approximately 1800 persons have been trained. There is need to review the working of the summer institutes and suggest ways and means for a follow-up to find out to what extent the intended benefits accrue in reality, commensurate with the financial commitments involved.

Inservice Training in other countries

53.6.13 A number of international organisations, viz., United Nations Development Programme (UNDP), Food and Agriculture Organisation (FAO) of the United Nations, Colombo Plan, etc. offer facilities for specialised training in specific subject matter areas in developed countries. Likewise there is a provision for such training in the agreements entered into with various countries. Although the participants have found such training extremely rewarding, it has been observed that quite often they are transferred to other assignments where the training received is not fully utilised. While it is necessary that such opportunities should be fully utilised, it may be ensured that the trained persons are retained where they are most useful.

Information on Inservice Training

53.6.14 There is lack of adequate and reliable data about current manpower situation, namely, staffing pattern, classification of jobs, number of persons who have received inservice training etc. The concerned subject matter departments/organisations, instead of a Central agency, should in our opinion, be made responsible for collection

and analysis of these data for their own use and benefit. The data may be centrally pooled in the Ministry for purposes of information and for correcting regional imbalances, if any.

Division of Responsibility for Organisation

53.6.15 At the State level, broadly speaking, there are three categories of administrative personnel for inservice training, namely, higher level, middle level and lower level. To train these categories of personnel, there is need for rationalizing and distributing the responsibilities at various levels, viz., Central and State Governments, the proposed Indian Institute for Agricultural Administration and Management (Chapter 62 on Administration), agricultural universities etc. In this connection paragraph 53.5.40 may also be referred to.

Funding

53.6.16 The steps suggested for the improvement of the inservice training programme in the preceding paragraphs may not be effective unless and until adequate financial support is made available to the agencies conducting such training programmes. A study of development plans reveals that there is no specific budget provision earmarked for the purpose of training and retraining of personnel responsible for implementing the developmental schemes. At present respective departments of the State and Central Governments meet the expenses of trainees. There is disparity in allowances paid to trainees of different States undergoing the same training course at the same time and place. This disparity is likely to vitiate the congenial atmosphere of training centres and should be removed. It is recommended that the expenditure for training should be earmarked and placed at the disposal of training centres with the proviso that the same allowances and amenities are enjoyed by the trainees irrespective of the States which they come from.

7 EDUCATION AND TRAINING IN ANIMAL SCIENCE*

53.7.1 Livestock production contributes a major share in the total agricultural output in a number of agriculturally developed countries. This has been made possible by the application of animal science* and technology for livestock improvement. In India, livestock contributes only a small fraction to the agricultural economy at present. The problems to be encountered in bringing about livestock improvement are by no means simple. But vast possibilities lie ahead of livestock industry with judicious use of a scientific knowledge and improved husbandry practices.

53.7.2 To improve livestock by the application of science and technology, one of the essential pre-requisites is the creation of a sound and efficient system of education in animal science. A brief review of the present system aimed at identifying its strong and weak points is, therefore, in order.

53.7.3 It has to be emphasised that provision of facilities for education is not enough. Along with it very careful planning is required to ensure that the investment made in establishing the facilities is fully utilised. Effective planning is also necessary to ensure that knowledge and research experience gained in the classroom, laboratory,

---

* The term 'animal science' has been used in this section to denote the composite scientific discipline having three broad divisions, viz. a) veterinary science, b) animal production and (c) animal products technology.

farm, plant or clinic get scope for application. The country can ill afford any under or mal-utilisation of facilities created and of qualified personnel trained at great cost. "It has been estimated that even under favourable conditions the per pupil cost of technical education is about three to four times as great as in humanities".[1]

Development of Education in Animal Science in India

53.7.4 A beginning in formal education only in one of the three divisions of animal science, viz., veterinary science* was made in India in 1862, when a veterinary school was opened in Poona. The school was started with the very limited objective of educating Indians for serving as assistants in remount depots and military farms. These assistants were required to treat small wounds and minor ailments and perform castration, vaccination etc. One more such school was opened in 1877 at Hapur. In course of time it was found that the extent of training imparted in these schools was inadequate and needed upgrading. Consequently, a veterinary college was established at Lahore (Pakistan) in 1882.

53.7.5 Following frequent recurrence of famine and cattle plagues, several commissions were set up towards the end of the 19th Century to go inter alia into the question of cattle plagues and preservation and maintenance of health of bullocks. On the recommendations made by these commissions,

---

1 Oliver Popenoe, 1966. The importance of Education in National Development. International Development Review, p. 9

* Also referred to as veterinary medicine or veterinary medicine and surgery.

a civil veterinary department was established in 1891. With the establishment and expansion of civil veterinary departments, necessity arose for more veterinary colleges and by 1930, six were established in undivided India (including Burma).

Lack of Facilities for Higher Education

53.7.6 The requirement of entrance to these colleges was the matriculation certificate, and the duration of study was limited to three academic years. The Lahore Veterinary College, however, extended in 1919 the period of study to four years. The successful students were awarded diplomas but not degrees. Since veterinary education requires some knowledge of animal production subjects a small content of these was included in the college curriculum. Thus, in the Lahore Veterinary College, out of a total allocation of 2,865 hours only 75 hours were scheduled for theory and practice of animal genetics, nutrition and management.

53.7.7 With the establishment of the Veterinary Departments, two classes of service personnel were created - one of senior service, comprising Veterinary Surgeons and the other of subordinate service consisting of what was designated as Veterinary Assistant Surgeons. The veterinary colleges in India catered for the education and training of the Veterinary Assistant Surgeons. The higher education necessary for a Veterinary Surgeon was, as a rule, obtained by studying in one of the Royal Colleges of Veterinary Surgeons in Great Britain.

53.7.8 A formal beginning of education in dairying which comes under the divisions of animal production and animal products technology (foot note to paragraph 53.7.31) was made in India as late as 1923. This was primarily for training Indian personnel for working in subordinate posts in military dairy plants, creameries and dairy farms. The course of training covering two years after matriculation was initiated at the Imperial Institute of Animal Husbandry and Dairying at Bangalore. It was designed for the conferment of Indian Diploma in Dairying (IDD) on the lines of the National Dairy Diploma awarded by the Royal Agricultural Society in the UK. A similar diploma course was initiated next year, i.e, in 1924, at the Allahabad Agricultural Institute, Naini.

53.7.9 The recommendations of the Royal Commission on Agriculture (RCA) in 1928 were significant for the reorganisation of Animal Husbandry and Veterinary Departments as also for education and training in veterinary science and dairying in India. While discussing animal husbandry and veterinary subjects the RCA expressed the view that the then existing organisation of the Civil Veterinary Departments was wholly inadequate to cope with the enormous animal disease problems. To meet the situation, the RCA advocated a four-fold increase in the employment of Veterinary Assistant Surgeons. A structural reorganisation of the departments with adequate provisions for superior staff of Veterinary Surgeons was also recommended. Concerning the required training of personnel for the proposed enlarged and more efficient veterinary service,

the RCA supported the view expressed earlier by the veterinary authorities in India that two distinctly separate veterinary educational programmes were needed in the country; one would be the training programme for Veterinary Surgeons and the other for Veterinary Assistant Surgeons. The RCA further advocated that facilities for training Veterinary Surgeons should be developed in the country. Early initiation of higher education in veterinary science was necessary since the need of a large contingent of technically qualified staff could not be speedily achieved by continuation of the practice of Indian students going abroad for higher studies. The RCA also recommended that higher education in veterinary science was to be so developed in India that it became similar to that obtainable from the Royal College of Veterinary Surgeons in England. It was further suggested that the facility for higher training should be arranged in collaboration with a university so that education and training finally lead to the award of a Bachelor's degree. The RCA also recommended that for fully qualified Veterinary Surgeons, their education at the university should either include or be supplemented by a not-too-long period of training at the Imperial Institute of Veterinary Research at Mukteswar (subsequently redesignated as the Indian Veterinary Research Institute (IVRI).

53.7.10 On education in dairying, the RCA expressed the view that the IDD course might be continued for the time being at the Imperial Institute of Animal Husbandry and Dairying. The Provinces should, however, develop facilities to provide instruction in dairying in their agricultural

colleges in view of the fact that agriculture had by then become a Provincial subject.

53.7.11 For the introduction of university level education in veterinary science, the RCA suggested that one of the existing veterinary colleges could be selected for this purpose. Any additional expenditure involved in the provision of additional staff, equipment and possibly also buildings should be met by the Central Government.

53.7.12 The recommendation of the RCA concerning the upgrading of one of the veterinary colleges for award of university degree was not implemented. However, the Madras Veterinary College, in collaboration with the University of Madras took the lead to initiate in 1936 university level veterinary education (B.V.Sc.) in India. The curriculum and syllabus as existed for the diploma course were revised in consultation with the university authorities. The Interscience certificate was made the entrance requirement in place of the matriculation. During the early years, the duration of study for the degree course differed somewhat but was finally fixed as four years. In the early forties, the Lahore Veterinary College followed the lead given by Madras. Other veterinary colleges continued with their diploma level education. As a consequence, for a number of years there were, in fact, two levels of education in veterinary science available in the country.

53.7.13 To meet the requirements of increased developmental activities following Independence to augment livestock production there was rapid expansion of educational facilities. Thus, between 1946 and 1948 five veterinary colleges were established. Only after a few years, in 1955 alone four more veterinary colleges were brought into existence.

53.7.14 As mentioned earlier, the first agricultural university was founded in 1960 at Pantnagar, Uttar Pradesh. The number of such universities increased very rapidly. Within a decade and a half 21 agricultural universities have been established in the country. In the initial stages the agricultural universities required at least two constituent colleges for the award of baccalaureate degrees. Usually one was of agriculture and the other of veterinary and animal husbandry. In course of time, the existing veterinary colleges excepting one, were made constitutent colleges of the agriculture universities.

53.7.15 Accepting the example of the Madras Veterinary College, gradually the other veterinary colleges got affiliated to universities, revised the course of study and created facilities for Bachelor's degree level education. In addition to the task of animal disease control, the responsibility of livestock development had devolved on the Veterinary Departments. As a result, there was a growing realisation that animal production(animal husbandry) subjects need be given greater attention in veterinary education. This led to the introduction of a composite course of training by making an adjustment in the existing course, namely some increase in the course content of animal production subjects at the expense of veterinary subjects because the total duration of study remained four years as before.

53.7.16 The UP College of Veterinary Science and Animal Husbandry at Mathura, established in 1947, started a composite

degree in B.V.Sc. and A.H. by increasing to some extent the quantum of animal production subjects. Other veterinary colleges followed suit and at present excepting a few all the veterinary colleges award a composite degree. Composite course of study is, however, followed in the veterinary colleges but without awarding the composite degree.

53.7.17 Dairy development received considerable attention following Independence. This necessitated an increase in facilities for education in dairying. Imperial Institute of Animal Husbandry and Dairying, and the Allahabad Agricultural Institute that were conducting the IDD course of training were already in existence. To meet the growing demands, three other institutes, viz., (a) Dairy Technology Institute, Aarey Milk Colony, Bombay, (b) Dairy Science College, Institute of Agriculture, Anand and (c) West Bengal Institute for Training in Animal Husbandry and Dairying, Haringhata, were set up that offered similar IDD course. For sometime, the IDD course was also organised at Karnal where the Dairy Institute was shifted in 1955 but the training of students was started in 1961. The training programme was, however, discontinued after a few years, the last batch of students being admitted in 1968.

53.7.18 In view of the growing developments in dairying, the IDD course was revised from time to time according to the recommendations of the Sub-Committee on Dairy Education constituted by the Indian Council of Agricultural Research (ICAR). At present, there are two categories of the IDD, one of dairy technology and the other of dairy husbandry.

53.7.19 Bachelor's degree level education in dairying was introduced in 1957 by the Dairy Science College established at the National Dairy Research Institute (NDRI). The college was affiliated to the Punjab University. The duration of study for the degree programme was fixed at three and half academic years and the admission requirement was inter in science. In 1961, the duration of study was extended to four years. As in the case of IDD, the Bachelor's degree in dairying was also divided into two categories - dairy husbandry and dairy technology. In the same year, the Agricultural Institute at Anand initiated a Bachelor's degree course in dairy technology. Regular post-graduate training in dairying was developed at the NDRI in 1961 with facilities for specialisation in a few selected subjects. Facilities for specialisation in many more subjects were rapidly developed and for M.Sc.(Dairying) fourteen subjects of specialisation are available at present at the NDRI. Doctorate degree level training in dairying with choice of specialisation from a large number of subjects is also available there. The Allahabad Agricultural Institute started an M.Sc.programme in dairy technology in 1968. Facilities for post-graduate training in dairy engineering was created at the IIT, Kharagpur, West Bengal.

Present Status

53.7.20 From the review of development of education in animal science in India, it is obvious that within a short period of time there has been a rapid growth in university

level education. Till 1936, except diploma level training, no facilities were available for higher education in veterinary science. At present 21 veterinary colleges are offering Bachelor's degree level education. Barring one, they are also offering Master's degree courses and the majority of these are imparting doctoral degree level education. Besides, there is a postgraduate college at the IVRI and a postgraduate institute at the Punjabrao Krishi Vidyapeeth, Akola. In the field of dairying, there were no degree level courses existing before 1957 and no regular postgraduate courses up till 1961. At present, facilities are available for training at Master's and Doctorate degree levels in a large number of subjects. At the IVRI and the NDRI and some agricultural universities facilities have been created also for postdoctoral research work. This expansion of educational facilities is no doubt impressive. The point for consideration, however, is whether the existing expanded educational programmes are suitable and adequate to fulfil the present and the anticipated needs of the future.

53.7.21 An efficient livestock enterprise involves three basic well-defined activities, viz., (a) the breeding and rearing of stock to optimise production; (b) providing adequate health cover to the animals to ensure efficient reproduction and production; and (c) profitable utilisation of animal products. The divisions of animal science that are concerned with the above mentioned activities, as mentioned earlier are: (a) animal production (animal husbandry); (b) veterinary science; and (c) animal products technology

respectively. An effective support to livestock development can essentially be provided by university level education in animal science. Education at this level should aim at endowing the students with not only a broadbased knowledge of basic and biological sciences but also with knowledge and training at high level in one of the three divisions. The scope and scientific and technical content of each of the three divisions of animal science have enlarged to such an extent that to justify the award of the first university degree, viz., the Bachelor's degree, it is necessary to have more than four years of intensive study. Additionally, it is essential to have good practical training for a reasonable period in an animal farm, or an animal product processing plant, or a laboratory, hospital or clinic, as the need be.

53.7.22 When Bachelor's degree level education was initiated in veterinary science with a four year programme, the duration of training was utilised mainly for teaching veterinary subjects. Subsequently, as mentioned in paragraph 53.7.15, the introduction of the composite course without increase in the duration of study beyond four years did justice neither to veterinary nor to animal husbandry subjects. This defect has persisted to the detriment of both. Deficiency of a different kind is noticeable in dairy education, the facilities for which have grown largely at the NDRI in isolation of other animal science and agricultural subjects. In the NDRI campus, there are no other institutions concerned with the subjects of animal science and agriculture. Education and training now being imparted in veterinary science and dairying, encompass only limited aspects of animal production

and animal products technology. For a comprehensive university level educational programme in animal production and animal products technology, a great deal more is required to be done. Considering all these facts, it can be said that a well balanced and comprehensive educational programme in animal science has not developed in the country. There is no doubt that mainly because of historical reasons this sort of a lopsided educational programme has come into being. The most serious inadequacy in the existing system is in the area of training in animal production.

53.7.23 The first Joint Indo-American Team constituted in 1954 to make recommendations on future development of agricultural education in India, had pointedly drawn attention to this deficiency in the education programme in animal science. The situation remains almost where it was two decades ago. The Working Group on Veterinary subjects in the Indian Council of Agricultural Education constituted by the ICAR, had also felt the necessity of having a separate degree course for animal husbandry. In a meeting of the Group held in 1958, it was stated "that the time has come when separate degrees must be awarded for Veterinary Medicine and Animal Husbandry". The second Joint Indo-American Team in its report published in 1960 expressed the view that the programme of composite training in veterinary science and animal husbandry existing in India was not adequate and there was a need for greater specialisation. The team recommended that animal husbandry should be treated as a major subject of study and developed into a strong independent department. Emphasising the urgency and importance of raising the level of training in animal husbandry, the team made the remark

that"this subject has too long been neglected by the colleges and rapid development of greater knowledge is of imperative importance to the economy of livestock industry in the nation".

53.7.24 In 1962, Consultants to the Rockefeller Foundation made a study of the academic programme in the subjects of veterinary medicine and animal husbandry in the National University, Bogota, Columbia.[1] It is to be noted that, as in India, livestock industry in Columbia is underdeveloped. At that university, veterinary and animal husbandry subjects were combined in the teaching programmes for university degree as in India and the requirements for graduation in animal science are similar. The Consultants recommended that independent programmes of study for animal husbandry and veterinary medicine should be developed in the National University. They also advocated establishment of one Department for Animal Husbandry and another for Veterinary Medicine in the university. This reorganisation was recommended because according to the Consultants, it was no longer possible for a student to acquire competence in both animal husbandry and veterinary medicine in 5 years of study. They firmly believed that this period of time was required to train a specialist in either of these disciplines. It was further recommended by the Consultants that the students should have a uniform core of basic and applied subjects for the first two years and then pursue separate programmes for specialisation during the last three years. It was made clear that for teaching

1. Pritchard W.R.and K.L. Turk, 1961, August. A study of the College of Veterinary Medicine and Animal Husbandry at the National University, Bogota, Columbia, Revised April, 1962.

animal husbandry subjects all classes of livestock such as dairy cattle, beef cattle, sheep, swine, horses and poultry should be included. The reform in the training programme recommended by them for the National University of Columbia. was, in the opinion of the Consultants, equally applicable to similar institutions in Columbia and in other countries in South America. This was so because the revised programmes conformed to the animal science educational programmes evolved in countries with advanced animal farming. In agriculturally developed countries with prospering livestock industry, available facilities for educational training in animal production and veterinary medicine lead to the award of independent graduate (Bachelor's) and postgraduate (Master's and Doctoral) degrees. Such an educational programme is unlike what exists at present in some less developed countries that confer a composite degree. With growing awareness of the need and potentialities of livestock development for advancement of agriculture, developing countries are orienting educational programmes in animal science on the lines of those prevailing in advanced countries. The participants in the first as also the second World Conference on Animal Production emphasised the necessity of creating facilities for imparting specialised training in animal production in the developing countries where animal production lagged behind agriculture and animal health. The situation as depicted above applies wholly to the condition prevailing in India at present. There is no unanimity of opinion on what precisely constitute animal production subjects. But if the existing curricula for the composite Bachelor's degree course is examined, it would

appear that animal production subjects do not account for more than 40 per cent of the total course content in any of the veterinary colleges in India. The present content of animal production subjects in the composite B.V.Sc. and A.H. degree course is inadequate to equip the students with the extent of knowledge expected of them for a university degree in animal production proper.

53.7.25 Nearly half a century ago, the RCA had pointed out that a period of study for six years after matriculation is required for the training of fully qualified veterinary surgeons, who at that time were considered fit to opt for state appointments in Great Britain. When the Madras Veterinary College initiated a Bachelor's degree programme about four decades ago the objective was to train only well qualified veterinarians and not persons with a composite training in veterinary science and animal production. Hence, in the course content, animal production subjects were included only to the extent required for imparting good education in veterinary science.

53.7.26 During the course of the last half a century there has been remarkable progress in veterinary science and the course content has increased considerably in the leading veterinary colleges of the world. The veterinary curriculum now includes subjects like "veterinary public health, laboratory animal medicine, basic medical research, production of biologicals, drug testing and control, animal disease regulatory programmes, inspection of food products of animal origin, pet or mixed practice in cities and farm animal practice in rural areas. Besides, attention has to be focussed

on diseases of fish and other wild animals, to diseases of invertebrate animals in general and to problems of comparative animal behaviour."[1] In the USA, where veterinary medical education is of a very high standard, striking changes have occurred in the educational programme in recent years as the scope of activities for veterinary profession is continuously enlarging. The veterinary medical curriculam in the USA are remarkably similar to those of human medicine. Post doctoral clinical educational programmes designed somewhat on the lines of residency programmes in human medicine are being developed in some of the veterinary schools in that country. In California, postdoctoral clinical education will soon be needed for practitioners who desire specialised skills for both food animal and pet practices. Development of comparative medicine is opening expanding avenues in the USA and some countries in the European continent for veterinarians with suitable educational background. With expanding and diversified areas for application of veterinary science, the course content as well as time for its completion has increased. With Inter in Science as entrance qualification even a four year course of study devoted mainly to veterinary subjects is not adequate to prepare the students for being well-qualified veterinarians.

53.7.27 The tropical and sub tropical regions of India have animal health problems more complex and difficult than those prevailing in temperate regions of the world. Added to these, the existing inadequacy of transport and communication facilities in different tracts of the country create many problems and difficulties in the organisation of an efficient animal health

---

1. 1969, July. Long Range Planning Committee for Animal Science Programme, Report of: p.10, Mysore University of Agricultural Science.

cover. India can, therefore, ill afford to have veterinarians who are not adequately qualified .

53.7.28 Both veterinary science and animal production have to be developed simultaneously as separate subjects in order that they can contribute meaningfully to the development of livestock industry. High levels of excellence in both the disciplines should be available in the country. But little has been done so far in this direction in India. This would involve,to start with, necessary changes in education in animal science. There are prevailing views that contend against a change in the composite educational programme of veterinary science and animal husbandry. According to one view, because of slender financial resources, the country cannot afford having two separate cadres of service personnel, one for development of animal husbandry and another for providing veterinary services. It is further argued that with the present state of development of livestock industry, persons trained under the composite educational programme would be good enough for the poor quality stock, even assuming that their knowledge and skill in veterinary science and animal husbandry may not be of a very high order. If the objective of rapid improvement of livestock is accepted, the fallacy of these view points becomes obvious. It is precisely because the stock is poor that a rapid improvement is necessary. To bring this about both veterinary science and animal productio need to be developed simultaneously as separate subjects to high levels of excellence. It cannot be accepted that the poor quality stock would continue to remain poor and their care and attention could be left under the charge of persons whose

training is not of a high order either in veterinary science or in animal production. High level knowledge and skill in veterinary science and animal production are required to lend mutual support for rapid livestock improvement. There is no other way. Whatever may be the reason, the fact remains that in spite of the advocacy of the first and second Joint Indo-American Teams and the ICAR for upgrading animal production education since long, no concrete action has emerged so far. We, therefore, strongly recommend that the ICAR should, on a priority basis, initiate action for introduction of a separate Bachelor's degree programme in animal production in the agricultural universities.

53.7.29 Education in dairying has remained isolated so far and has not become integrated with the mainstream of educational programme in animal science in India. It can be best organised in an integrated manner in the agricultural universities. There are several advantages in developing educational programmes in dairying in agricultural universities. Dairying as a part of animal production is inseparable from agriculture, and the problems of the farmer do not fall into sharply defined categories of crop production and livestock production and health maintenance of the stock. Hence, the institutions for rendering effective service to the farmer with regard to crop and livestock production should be located in close proximity to each other. The first Joint Indo-American Team had pointed out that the isolated locations of institutions for education and research in agriculture, veterinary science and animal husbandry were unsatisfactory and hampered the educational and training functions. What was said

by the Team of agriculture, veterinary science and animal husbandry, applied equally to dairying. The RCA recommended that education and training in dairy science might be developed in the provincial agricultural colleges. In the Land Grant universities in the USA, on the model of which the agricultural universities in India have been founded, education in dairying constitutes an important part. We recommend that to make a beginning, agricultural universities located in some of the States where dairying is showing a promise of rapid development take early action to organise dairying course at Bachelor's degree level. We further recommend that the Central Government should come forward to grant, through the ICAR, adequate financial assistance to selected agricultural universities agreeing to initiate such educational programme in dairying. The financial assistance should meet requirements of additional facilities for dairy farm, student-dairy plant, buildings, laboratory equipment, library material, teaching staff etc.

53.7.30 There is another aspect of dairy education in India that needs attention. The bulk of the educational programme in dairying is at present being implemented at the NDRI. This Institute should primarily concentrate on researches in dairying that are of national importance. University degree as well as diploma courses are currently being conducted by the Institute. These training programmes not only demand substantial amount of time of the research staff but also divert financial and other resources that could be used with better advantage for research. The NDRI should not,

therefore, continue the teaching programmes which can easily be carried out in agricultural universities. We recommend that the NDRI divests itself of the burden of teaching the IDD course very soon and the Bachelor's degree course in dairying as soon as the agricultural universities initiate the reorganised educational programme in animal science on the lines indicated in paragraphs 53.7.31 to 53.7.34 and 53.7.36.

53.7.31 The existing educational programme in dairying includes training in dairy technology that is concerned with handling and processing milk, and various milk products. With increased tempo of livestock development, milk as also other animal products like meat, eggs, wool are being produced in progressively larger quantities. For better commercial exploitation of different animal products, it is essential that not only dairy technology but also technology of other animal products is developed expeditiously. This would be facilitated by organising in stages, teaching programmes in animal products technology. Poultry production has greatly increased in recent years. The development of educational programme in poultry product technology has, however, lagged behind.

53.7.32 How best the reorganisation envisaged above should be brought about is the most important question. The agricultural universities provide decidedly the best organisation as has been discussed in earlier paragraphs. One of the ways of achieving the objective of integrating the three divisions of animal science in the educational programme is to have three separate faculties one each of animal production, veterinary

science and animal products technology. Another way could be to have one faculty for both animal production and veterinary science and a separate faculty for animal products technology. Yet another way could be to have a separate faculty for veterinary science and one faculty for both animal production and animal products technology. A simpler approach would be to organise the training programme under a single faculty. After careful consideration of the pros and cons of each of these possibilities, we are of the opinion that the single faculty organisation would be the best. It has the following advantages:

i) All the three divisions being parts of the composite discipline of animal science, teaching under one faculty would ensure a better coordination and a more balanced and integrated development of animal science.

ii) A number of common subjects can be organised and taught more economically and efficiently avoiding duplication of material, staff and efforts.

iii) One faculty would foster a better sense of professional brotherhood among the students of the three divisions.

53.7.33 While dairy production can be logically and conveniently integrated with animal production, animal products technology deserves separate treatment. The animal products are diverse in nature and so are the technologies. As such no common teaching programme is feasible. Keeping in view the present state of development of livestock in the country and the perspective for the next quarter of a century, the teaching programmes in animal products technology could include for the time being (a) dairy

technology, (b) meat and poultry product technology, and (c) wool technology. The training programme should be developed only in a few selected agricultural universities after assessing the demand for training and ensuring adequate facilities by way of staff, equipment, buildings, product availability etc. Development of a high standard of training facilities in animal products technology is expensive and it can be justified only when effective utilisation of the facilities created is ensured.

Organisation of Revised Programme

53.7.34 The proposed reorganisation and restructuring of the educational programme in animal science can be conveniently carried out with the help of the facilities in some of the existing centres of education and training. As necessity arises, additional facilities may be provided. Facilities for education and training in different aspects of dairy science, particularly dairy technology do not exist in agricultural universities.* It may not, therefore, be possible to develop teaching programme simultaneously in all the divisions of animal science at the same place. We suggest that courses in animal production and veterinary science at Bachelor's degree level are started first. Depending on the importance of an area for particular animal products, appropriate technology courses may be developed in the agricultural university that exists in that area or region.

53.7.35 The entrance qualification for Bachelor's degree courses in veterinary and dairy science was Interscience in view of the requirement of that level of knowledge of mathematics,

* Gujarat Agricultural University has the facilities for training in dairy technology.

physics and chemistry with or without biology.

With the abolition of Inter science stage after Independence, the requirement of admission to veterinary and dairy science colleges were modified differently in different States depending upon the prevailing school and preuniversity systems. In general, the basic principle followed was that the students were required to take additional courses to reach the equivalent of Inter science level before they were introduced to technical subjects. Changes are again taking place in the general educational system at the school and preuniversity levels. Whatever be the changes, we recommend that as the minimum requirement, the students must acquire the level of Inter science before admission to the degree courses. It would, however, be desirable to have a reassessment on an all-India basis to ascertain whether implementation of the principle has been satisfactory in all the States. A reassessment at the stage of transition would help set up a uniform standard. This would eventually make inter-State migration of students easier.

Proposed Baccalaureate Degrees

53.7.36 For the reorganised education system in animal science we recommend that Bachelor's degree courses may be developed initially as follows:

i) B.V.Sc.
ii) B.Sc.(Animal Production)
iii) B.Sc. (Dairy Technology),
iv) B.Sc. (Meat and Poultry Products Technology),
v) B.Sc. (Wool Technology)

The present four year course for B.V.Sc and A.H. and B.Sc. (Dairy Technology) is considered inadequate for the existing course content and level of education by several teachers of the subjects. Moreover, it is not possible to arrange good practical training within this period. Deans of the veterinary and dairy science colleges of some reputed agricultural universities are of the opinion that for teaching the proposed degree courses, a period of more than four academic years would be required. They are also of the opinion that an internship of one year should be fixed for the B.V.Sc. students and a practical training for six months for the others. In consideration of these views of the educationists in animal science subjects, we suggest that the duration of study for the proposed courses should be more than four years. In a professional course of study field training is meaningful in several respects. We, therefore, further recommend the introduction of internship or intensive practical training for a fixed period finally decided upon by a special committee specifically appointed to examine this issue as mentioned later in this section. The implementation of these recommendations may raise some problems with regard to the fitting in of the additional duration with the trimester system. There may also be the problem of finding adequate number of institutions where internship or practical training could be arranged without sacrificing quality. These difficulties should not, however, be insurmountable. There are a large number of veterinary hospitals in the States. Several of these would be suitable for making arrangements for internship of the students

studying veterinary science. Infarm training of students in animal production group should be possible in selected Government livestock farms as also private and military dairy farms. Similarly, it may not be difficult to arrange inplant training of the students in dairy technology in several of the dairy plants being managed by civil and military establishments. Selected abattoirs and the Central Food Technology Research Institute would be suitable for inplant training of students in meat and poultry products technology. The periods suggested for study and internship or practical training are not meant to be rigid. The matter needs to be gone into very carefully by a special committee mentioned later in this section.

Elective Subjects

53.7.37 In case of B.Sc. (Animal Production), it would be necessary to provide students with the choice of elective subjects according to their preference, viz., dairy production, pig production, poultry production, sheep production, etc. We are of the view that it would be preferable for the students to take the elective courses during the last six months of the study period. The suggested period is, however, tentative. The final decision in the matter should be taken after a study by the special committee (referred to later in this section). After the animal production course has been introduced in agricultural universities, there would be no necessity of continuing the existing degree course in dairy husbandry at the NDRI.

Common Core Subjects

53.7.38 In a multifaculty academic institution there would be common subjects of study. In the same faculty the overlapping is wider. In order to maintain uniformity of standard and to avoid unnecessary duplication of efforts, common subjects are, in general, conveniently graded into two or three stages, each fulfilling the standard required by a particular group of students belonging to several related disciplines. A similar procedure may be followed in education in animal science for the subjects that are common for agriculture and animal science as also for the different groups in animal science. To cite a few examples of such common subjects, mention may be made of soil-water-crop management, farm economics, statistics, biochemistry and workshop training that are common for agriculture and animal science and anatomy, genetics and physiology common for different groups in animal science.

Revision and Recasting of Curricula and Syllabi

53.7.39 Before the recommendations made above are implemented a thorough revision of curricula and syllabi, their recasting would be required. This should be done with very great care keeping in view not only the academic requirements and technical skill but also those of the developing livestock industry. We recommend that the ICAR or the Association of Agricultural Universities should constitute a special committee to suitably recast the curricula and syllabi taking into consideration the proposed reorganisation of the educational programme in animal science subjects. This committee should also look into

the question of entrance requirement, elective and common core subjects, and the periods required for study, internship and practical training. The agricultural universities, ICAR, UGC, concerned State Departments and the livestock industry and trade should be represented on the committee. As soon as the restructuring of animal science educational programmes on the recommended lines become effective, the conferment of composite degrees by agriculture and veterinary colleges should be discontinued. The present practice of the teaching of animal science subjects in agricultural colleges of agricultural and general universities should, for the same reason, be discontinued as soon as possible.

Adequacy of Practical Training

53.7.40 There is a persistent general criticism that graduates, although having good theoretical knowledge of subjects, lack adequate practical training of the proper kind. Consequently, they are unable to handle with confidence practical problems encountered in the field and farms. The introduction of composite courses in veterinary science and animal husbandry led, as mentioned earlier, to curtailment of teaching hours that could be allocated for practical work. Besides, in some of the teaching institutions, there is a tendency to undervalue practical work. The responsibility of practical work is generally relegated to the junior members of the teaching staff because of the low importance often attached to this subject. We recommend that early action should be taken to associate the senior members of the teaching staff with the practical work of students. It has been brought to our notice that practical training work

is hampered in many instances due to lack of essential facilities like laboratory equipment, livestock farms, clinics, teaching aids, etc. in the educational institutions. Such inadequacies should be rectified immediately.

Postgraduate Education

53.7.41 The second Joint Indo-American Team while admitting the need for expanding the facilities for postgraduate education in animal science subject in India emphasised at the same time the necessity of exercising great caution in the matter. The Team advocated that such facilities might be created only at places where a strong research base had already developed. They also emphasised the need for having teachers and research workers of high merit for postgraduate education and research. Considering the fast rate of establishing centres of postgraduate studies in animal science subjects in agricultural universities, doubts have arisen in our mind whether due caution was exercised in all instances. The justification of a postgraduate department was more on the side of prestige symbol than on the actual urge and capacity to achieve quality and excellence. In some of the affiliated or constituent colleges of universities, postgraduate teaching in some of the animal science subjects have been started even though Bachelor's degree level teaching in those subjects is not available. Postgraduate teaching without corresponding graduate level programme may be justified in some research institutes but not in institutions principally engaged in teaching. Even in research institutes such programmes should not be taken indiscriminately. Facilities for postgraduate teaching have been created in a large number of subjects in the IVRI and the NDRI. We understand that some of these facilities have remained underutilised and some even unutilised for years

in a row. The circumstances in which postgraduate teaching may be introduced in research institutes have been discussed later in this section.

53.7.42 Postgraduate education cannot be imparted to the general run of students. Not only is it more expensive than graduate education but it also requires students of better quality. Admission of students to postgraduate courses should, therefore, be on a selective basis. The screening for admission should be done with great care and with rigid enforcement of a high standard. There are reasons to believe that the necessary standards were not adhered to at least in some cases. In view of this, a thorough and critical review and evaluation of the facilities for postgraduate education and training in animal science subjects developed so far in universities and Central and State research organisations would be advisable. We suggest that the ICAR should look into this matter.

53.7.43 As for the duration of postgraduate study we consider that for Masters' degree a period of not less than two academic years after Bachelor's degree, as is prevailing now, would be sufficient. For Ph.D. degree, the time required to complete the thesis work, apart from the required number of course credits, may vary depending on the nature of the problem but in no case should the period be less than two years after the attainment of Master's degree.

Disciplinewise and Specieswise
Master&s degrees

53.7.44 Master's degree programme is organised for attainment of a high standard of knowledge in a field of specialisation

(as major) through courses of study and research. The successful candidate thus acquires specialised training in a particular scientific discipline like, say, parasitology or dairy bacteriology. In consideration of the growing need of extension specialists working with a particular species of livestock, it is desirable to design and develop specieswise training programme for the award of Master's degree. Such Master's degree courses of study may, however, offer little scope for research credit.

Appendix 53.1 shows diagrammatically the proposed education programme in animal science.

Change of Field of Study

53.7.45 With the reorganisation of educational programmes, an eventuality may arise in which a student after obtaining Bachelor's degree in a particular discipline, say, veterinary science, may desire to enrol for Master's degree course in another discipline, say, animal nutrition or animal genetics. Similarly, a student with B.Sc. (Animal Production) may choose to go in for M.V.Sc. (Pathology). There need not be any bar to such enrolment provided the student first earns the required credits in the courses in which he may be found deficient and thereby fulfils the prerequisites for the Master's degree programme.

Educational Programmes in Central Research Institutes

53.7.46 While discussing the function of the IVRI, the RCA advocated that the Institute should have only limited teaching programmes as otherwise the primary function of the Institute of conducting research would be hampered. The first Joint Indo-American Team also recommended that the NDRI should become an important postgraduate agency. Earlier in paragraph 53.7.30

a mention has been made of the NDRI being involved in educational programmes that should preferably be the responsibility of a State agricultural university. Considering the present situation of the educational programme in animal science, we are of the opinion that the Central research institutes should undertake only the educational programmes of specialised nature that the agricultural universities, or other teaching institutions are at present unable to manage effectively. We feel that while the Central research institutes may be taking action in this direction, they should also start gradually withdrawing from the Master's degree level teaching programmes that have been developed in agricultural universities and other teaching institutions. Postgraduate certificate and diploma courses should also be discontinued in the Central research institutes when such programmes or degree courses in congnate subjects have been developed in other teaching institutions. We recommend that eventually the teaching programme in the Central research institutes should be kept limited only to doctoral degree level.

Postgraduate Certificate and Diploma Courses

53.7.47 Preservice or inservice training courses or inservice refresher courses at postgraduate level are of great value for attainment and maintenance of high efficiency in the working of service personnel. Such courses of training should, therefore, be arranged periodically by the agricultural universities/Central research institutes/or State departments. No diploma should, however, be awarded for such training courses where facilities are available for postgraduate degree courses in the same subjects.

Agricultural Universities and State Departments

53.7.48 Prior to the establishment of agricultural universities, the veterinary colleges, as a rule, used to be under the administrative control of the Directors of the State Veterinary Departments. Consequently, the coordination of the training programme in the veterinary colleges and employment of the graduates subsequently in the departments created no serious difficulties. In the field of dairying, the outturn of technically qualified persons has been relatively small, Moreover, employment of such persons is also not confined exclusively to the State departments. Hence, there has so far been no great problem in the utilisation of trained persons. With the advent of agricultural universities there has been in several States a lack of understanding among the agricultural university and the State departments with the result that the programmes of employment and of training do not harmonise well. The imbalance created in this manner would be frustrating for all the concerned parties but more poignantly for trained personnel. It is, therefore, necessary to take effective measures urgently to regulate the enrolment and outturn of university graduates to match the demands of employment. A close cooperation and understanding among agricultural universities and State departments are indeed essential if the maximum benefit is to be derived from the reorganisation of the training programmes. In this connection the need for drawing up a memorandum of understanding amongst the parties concerned, namely, the agricultural universities and the ICAR, agricultural universities and the state departments has been keenly felt and some initiative has already been taken in this direction. In our Interim Report on Some Aspects

of Agricultural Research, Extension and Training we have recommended that an "Apex Body" should be constituted in each State. These would have the overall responsibility of ensuring that agricultural universities and State departments work in harmony and in the best interests of all-round development of agriculture in the State. We strongly recommend the early constitution of such "Apex Bodies" in the States.

Funds for Animal Science Faculty

53.7.49 Deans of several agricultural universities incharge of veterinary science and animal husbandry faculty complain that funds allocated to the faculty are too inadequate to ensure high standard of teaching. The cost of research and education in animal science is high compared with most of the science subjects. As such, allotment of funds to meet annual per pupil cost of training should also be high. According to one estimate it is as high as Rs 3,000 and Rs 5,000 per annum per student at Bachelor's and Master's levels respectively. These estimates may appear high but unless per capita allotment of funds is increased, teaching excellence would suffer. Additional provision has to be made to meet establishment costs. Suitable financial provision should be made separately for other type of short term courses and special training. We, therefore, suggest that the authorities of the agricultural universities may re-examine the issue in its proper perspective and make allocations accordingly.

53.7.50 We are informed that no provision is made at present in the budget of long term research projects (5 years and longer) for updating the knowledge of technical personnel during the tenure of the project. Periodic inservice training and refresher courses are valuable aids for keeping service personnel abreast with uptodate knowledge and technical developments. Such aids are also necessary for the personnel working in long term research projects. We understand that agricultural universities and other research centres do not have funds allocated to meet such expenditure. We, therefore, recommend that in long term research projects, where it is considered necessary, an adequate amount may be kept earmarked fof the purpose of training.

Education and Training below University Level

53.7.51 Various training courses of different durations and different entrance requirements are at present being conducted in basic schools, multipurpose schools, rural institutes, agricultural colleges, and other institutions maintained by different State departments, local bodies and private organisations. This is being done usually for meeting specific job requirements in agriculture or livestock industry. The entrance requirement for these courses varies from the fourth standard to High School education. The content of animal science subjects included in the training courses varies a great deal. In some of the teaching programmes the quantum of animal science subjects may be very little, whereas some of the programmes may include almost exclusively animal science subjects. Stockman training

course usually requires High School qualification for admission and the duration of the training may be as long as two years. Many such training courses are serving useful purpose in fulfilling local needs. There is, however, a necessity to modify the courses on the basis of occasional review by competent bodies. Here also, as in the universities, provision of qualified and competent teaching staff and of requisite facilities like, farm lands, equipment, livestock, teaching aids etc. is equally important.

53.7.52 Differently graded levels of field assistants/ junior staff are required for work and assistance in all the three divisions of animal science. Well-thoughtout educational programmes have to be developed to cater for this need. Below-university level educational programmes are no less important than those at the university level.

53.7.53 The Indian Dairy Diploma course is serving a useful purpose at present. We are informed that employment of IDD holders has so far been cent per cent. This trend is expected to remain in years to come. This training programme has, however, created a problem of a different nature. Till very recently, an IDD holder even though considered competent and capable has had no opportunity of obtaining a university degree to improve his qualifications and prospects. Following representation the Dairy Science College at NDRI has initiated in 1975 a degree programme in dairying that would permit enrolment of candidates with IDD.

53.7.54 Junior staff with below-university level training are required to assist the graduates in their work in rural

and urban areas. The essentiality of such persons with intermediate level of training is no longer questioned. They are also required in large number commensurate with the widespread rural population to be served. We are of the view that the need for devising and establishing training programmes in all three divisions of animal science somewhat similar to the IDD programme is imperative. Besides persons with intermediate level of education and training, other personnel with lower level and with shorter duration of education and training are required as supporting staff for developmental work as well as for research and educational establishments. Such categories of staff include: Compounders and Dressers, Wool Shearers, Vaccinators, Skinners and Flayers, Farriers, Milkers, Inseminators, Laboratory Attendants, Assistants for equipment sterilization and workshop. Below university level educational programmes for all grades of assisting junior staff should be drawn up and executed as required by the concerned State departments in close collaboration with the agricultural university.

Higher Training and Promotion of Junior Staff*

53.7.55 While reorganising educational programmes in animal science and training personnel steps should be taken to improve the existing service conditions of staff, especially at the junior level. As an interim measure we recommend that three grades of junior staff, namely, Junior Field Assistant, Senior Field Assistant and Supervisor** be created in all the three divisions of animal science providing satisfactory service conditions for each grade.

---

* Junior staff with below university level education and training.
** The designations given are only illustrative; any other suitable designations may be used.

53.7.56 The basic training for Junior Field Assistants in each of the three divisions should be for 2 to 3 years after high school education. The curriculum and course content of the training programmes should be carefully prepared by the State Departments in consultation with the concerned agricultural university. Practical work should constitute the bulk of these courses limiting theoretical education to the utmost essential. Regular periodic inservice training should be arranged by the concerned State Departments for these personnel for betterment of their technical knowledge as well as career prospects. We recommend that after, say, 5 years of satisfactory service, a Junior Field Assistant should be required to undergo six-month inservice training, following the satisfactory completion of which he would become entitled to promotion to the next higher grade, viz., Senior Field Assistant. After completion of 5 years of satisfactory service as Senior Field Assistant, he may again take another six months' inservice training on satisfactory completion of which he would be entitled for promotion to the grade of Supervisor. What is important is the establishment of a strong and contented band of assisting junior staff with below-university-level education to lend support to senior staff with university education.

53.7.57 We feel that while steps are being taken to evolve below-university-level educational programmes in animal science that may be interlinked with university degree level education, the concerned State Departments should evolve sound incentive promotion schemes. The objective of such schemes

should be to reward a limited number of really competent and deserving employees with below-university-level education having at least five years of service with excellent records. We are of the opinion that a satisfactory way to give encouragement to such deserving employees would be to provide them with opportunities for university degree level education as State nominees or on study leave terms. Such schemes, if and when implemented, will act as an incentive to competent and devoted workers. Satisfactory service conditions and incentive schemes should also be evolved for other employees of still lower ranks like, Compounders and Dressers, Inseminators, Milkers, Skinners and Flayers, Workshop Assistants etc. mentioned in paragraph 53.7.54.

8 EDUCATION AND TRAINING IN FISHERY

53.8.1 The present annual production of fish in India is about 1.8 million tonnes comprising both marine and freshwater fish. It is estimated that with proper development the annual production could be raised to 8 million tonnes by the end of the present century by exploiting marine, estuarine and freshwater resources and utilising aquacultural practices. It is clear that such increased production is possible only by bringing about a substantial transformation in the fishing industry by making use of technology and science. Such development calls for suitably trained manpower in all spheres of fisheries activities at the operational, supervisory and executive levels. Traditionally, fishermen learn skills in fishing through experience. They are sufficient for the primitive type of fishing at the subsistence level. But a modern fishing industry needs a variety of skills, knowledge of fairly complex technologies and familiarity with instruments. In order to effect, therefore, a change from the traditional to the scientific fishing industry suitable educational programmes have to be initiated. The educational system must be relevant and adaptable to the existing conditions of the country.

53.8.2 Among the leading fishing nations of the world such as Japan, Norway, USA etc. modern fishing industry has developed through private enterprises. With the growth of fishing industry a pattern of fisheries education has evolved which suits the specific needs of each. In Norway there are several fisheries schools and separate schools for training fish processing technologists but no degree

level institutions. Several short term courses for fisheries personnel are also offered. Scientists and specialists are drawn from the general universities. In USA collegiate institutions impart instruction in fisheries with a strong emphasis on research concerning resources, fish population dynamics, aquaculture and food science. At the College of Fisheries, Seattle, Washington, courses leading to the Baccalaureate, Master's and Doctorate degrees in fisheries science are offered. In Canada there are graduate and postgraduate courses at the University level besides technical and vocational training facilities. In UK where the fishing industry is highly developed there is no broad programme for fisheries education as such, but there the nautical colleges train fishing hands and the crew of fishing vessels. Research workers are drawn from the marine and other institutions concerned with aquatic sciences having emphasis on fisheries research rather than biological research. No university in UK has currently provision for awarding degree in fisheries, but courses leading to the Master's degree in allied disciplines such as marine biology, oceanography, freshwater biology etc. are offered in universities. In Poland where development in fisheries has been relatively rapid there are several fishery schools and higher level training establishments for managerial personnel. There are also facilities for training specialised personnel such as processing technologists, refrigeration engineers, etc. Considerable emphasis is laid on the training of personnel

for vessel construction. In Japan there is a very elaborate system of fisheries education which is integrated into the national educational system itself; there are several fisheries schools, and also colleges where courses leading to Bachelor's, Master's and Doctorate degrees are offered. There are two fisheries universities and one more is being organised. The higher level educational institutions have played an acknowledged role in the transformation of the Japanese fishing industry, which was insignificant at the beginning of this century, to the foremost position among the fishing industries of the world.

53.8.3 In India, fishing industry is still organised on traditional lines. Developmental activities are centrally planned and the Government is required to take the leading role in the training of fisheries personnel. The personnel needed can be broadly classified into (a) those of the primary sector consisting of all sea going operatives in marine fishing, and the fish farm and fish culture operatives in the inland fisheries; (b) those for managerial operations in Fisheries Departments and industries; and (c) those for research and education. All these need training, some of a highly specific and others of a broad-based nature. The first category includes persons ranging from the skipper/engineer/ master fishermen to the deck-hand and engine room workers and from the supervisor of fish farms to the fieldman. The second category includes managers of fishing companies, processing plants, cooperatives, and development officers and executives of Fisheries Departments such as District Fisheries Officer, Extension Officer, etc. Gear Technologists, Fish Processing

Technologists, Senior Fish Culturists, Fishery Economists, Fish Marketing Officers and Statisticians belong to this sector. In the second category there are again the senior and the middle levels. The third category consists of research scientists and technologists, fishery education officers and technical persons in different fields of fishery management. Normally the levels of education required for the different categories of personnel are as follows: certificate or diploma for most of the first category; the university degree/post-graduate diploma/postgraduate degree for those of the second category and a postgraduate degree followed by minimum or 3-5 years' research experience in the specialised field for the third category.

53.8.4 Besides the above personnel there are those connected with other occupations which have a bearing on the fishing industry. Among these may be mentioned the manufacturers of vessels, fishing gears, marine engines, electronic fishing equipment, refrigeration, ice making and other processing equipment and civil engineers concerned with construction of freshwater and brackishwater fish farms. They have to acquire some broad understanding of the problems relating to fisheries, for which provision for orientation courses would be necessary.

Brief Historical Development

53.8.5 Fisheries education and training in India began with a course of training in inland fisheries development and administration started at the Central Inland Fisheries Research Institute (CIFRI), Barrackpore, in 1948. Another course in marine fisheries was started in 1950

at the Central Marine Fisheries Research Institute(CMFRI), Madras (later Mandapam), also in the same year. Kerala, Tamil Nadu and Andhra Pradesh Governments established fisheries polytechnics in the respective States. With the introduction of several fisheries development schemes in the First and the Second Plans the need for persons having the necessary technical knowledge and skills for implementing them was acutely felt. This resulted in the appointment of a Committee on Fisheries Education in 1958 by the Union Ministry of Agriculture. The Committee submitted its report[1] in 1959 which dealt comprehensively with all aspects of the problem and suggested certain steps for immediate action.

53.8.6 The facilities which existed for training in fisheries were provided either by the Central or State Governments. The training facilities for senior fishery staff at the university/college degree level were practically nonexistent. Some of the universities offered special papers in subjects having a bearing on fisheries at the M.Sc. level but treatment was rather academic. No university in the country could find it practicable to provide a composite professional training required in fisheries. Such a training programme could be taken up by the Government only. For the training of fisheries staff at the middle level, the training offered at the Inland Fisheries Training Unit (IFTU) of CIFE at Barrackpore, though useful, suffers

1 1959. Panikkar N.K. (Chairman), Chopra B.N., Gerhardsen G.M. and Kesteven G.L. New Delhi, Committee on Fisheries Education, Report of, Ministry of Food and Agriculture, Government of India.

from several shortcomings. It was not only restricted to inland fisheries but the training unit did not have adequate staff and physical facilities. The marine fisheries training course started at Madras/Mandapam had to be discontinued due to lack of trainees who were to be nominated by State Fisheries Departments. Polytechnics established by State Governments were imparting training of an elementary and theoretical nature but no worthwhile practical work. Most of them were also discontinued before long. Some of the State Governments have a programme of inservice training for their fisheries staff of middle level functionaries. For training fishery operatives a number of fishermen training centres were established by the Government of India jointly with the State Governments as mentioned in Chapter 38 on Marine Fisheries.

53.8.7 A number of fisheries extension units were established by the Government of India for transmitting scientific information of practical value to fishermen and fish farmers. These units trained village workers and field fisheries staff of the State Fisheries Departments besides carrying out extension work. Soon after their establishment they were prematurely handed over to the State Governments which either closed them down, or nominally took them as part of their Fishery Departments.

53.8.8 Considering the needs of the governmental development programme, all-India nature of the required training, need of special equipment, vessels, field training

facilities, selection and placement of trainees and their employment, the Committee on Fisheries Education (1959) recommended the establishment of a Central Institute of Fisheries Education (CIFE) for imparting education and training in fisheries. For imparting instruction to marine fishing operatives of all categories the Committee recommended the establishment of a Central Institute of Fisheries Operatives (CIFO). The CIFE was established in Bombay in 1961 and the CIFO in Cochin in 1963. Later in 1968, a second unit of the Operatives Institute was set up in Madras. In 1967 the Union Ministry of Agriculture established two regional training centres for inland fisheries operatives, one at Agra and the other at Hyderabad, utilising the staff of the fisheries extension units which were wound up. Subsequent to the transfer of the Inland Fisheries Research Institutes from the Ministry of Agriculture to the Indian Council of Agricultural Research, the training course conducted there was taken over by the CIFE. The two regional training centres at Agra and Hyderabad were also placed under the control of the CIFE. Later in 1973, an Extension Training Centre for senior extension personnel in inland fisheries replaced the operatives training centre at Hyderabad. A degree course in fisheries was started in 1969 by the University of Agricultural Sciences, Bangalore, at its College of Fisheries at Mangalore.

Present position of
Education and Training

53.8.9 The CIFE conducts a two-year course at the postgraduate level meant mainly for training district fishery development officers. For admission to the course a degree in science with zoology as one of the subjects is a prerequisite. For inservice candidates this condition may be waived. The course is of a comprehensive nature covering all the aspects of marine and inland fisheries, technology and administration. Sound theoretical knowledge along with the necessary emphasis on practical aspects is the objective of the course. It does not claim to impart specialised knowledge but is adequate to enable trainees to identify, estimate and manage resources. It makes the trainees familiar with fishing technology, fish preservation and processing, marketing, business management related to fishing industry, socio-economics, extension and administration. During the second year the emphasis is predominantly on field work. The institute has its field stations at Kakinada for training in brackish and fresh water fishing. Successful students are awarded a diploma which is recognised by the public service commissions as equivalent to the Masters's degree in biological sciences of Indian universities for purposes of recruitment to fisheries posts. The CIFE has been recognised by the University of Bombay as a research centre for work leading to the Master's and Doctorate degrees in zoology and biochemistry.

53.8.10 The one-year postgraduate course offered at the IFTU is meant for the training of fisheries personnel at the

level of Assistant Fisheries Officers. The majority of the trainees are State fisheries personnel on deputation. Several nominees from South East Asian countries have also taken the course. Admission is open to candidates having a degree in biology. Even though restricted in scope this course could not be very effective because of inadequate staff and facilities particularly for field work. For the latter the West Bengal Government fish farms and the field station of the institute at Cuttack are being availed. Those deficiencies should be remedied.

53.8.11 The regional training centres for inland fisheries operatives at Agra and Hyderabad are open to candidates who have completed SSLC. The training is for 9 months both in the field as well as in the classroom. Owing to lack of physical facilities the Hyderabad centre was closed down. The candidates having, in general, poor knowledge of English are handicapped.

53.8.12 The Fisheries Extension Training Centre, Hyderabad, was established in 1973 for conducting a 10 months' course for imparting training in extension methods and techniques to senior inland fisheries personnel. Admission is given to candidates having a degree in science with biology.

53.8.13 The Government of India appointe in 1970 an Evaluation Committee to review the functioning of the CIFE from its inception to the end of the financial year 1969-70 and suggested measures for improving its working. Another Inflow Committee of the CIFE was appointed in 1972 to look

into the question of inclusion of graduate and postgraduate courses in CIFE. Both the committees[1] strongly recommended the introduction of B.Sc. (Fisheries) and M.Sc.(Fisheries) degree courses at the CIFE for better utilisation of the expertise and facilities built up so far. The strengthening of the staff and modification of the administrative structure to bring it more in line with academic institutions were also suggested by the committees. The proposed reorganisation visualised the CIFE as the nucleus of a fisheries university. The Inflow Committee felt that in view of the present stage of development it may not be feasible immediately to accord a 'deemed' university status of the CIFE but suggested that it should seek affiliation with the university of Bombay for purposes of awarding degrees at the Bachelor's and Master's levels. The Evaluation Committee recommended discontinuance of the IFTU of CIFE at Barrackpore and also the operative training centres at Hyderabad and Agra. The Inflow Committee, however, was in favour of retaining the IFTU. The Evaluation Committee recommended that a course at the pre-university level be started at Kakinada for training which also would prepare candidates desirous of joining the B.Sc. (Fisheries) course at Bombay.

53.8.14 The CIFO was established with the aim of training personnel required to man the medium and distant water fishing vessels and also the supporting staff required by establishments ancillary to the fishing industry. The majority of the candidates are sponsored by the State Governments and private industry but a few are sponsored by the Government of India,

1 1971. Report of the Evaluation Committee on the Central Instt. of Fisheries Education, Bombay, Ministry of Agriculture (In Mimeo).

1972. Report of the Inflow Committee of the Central Institute Fisheries Education, Bombay, Ministry of Agri. (In Mimeo).

In addition, there is quota for foreign students, for example, from Maldives, Nigeria, Philippines, Fiji, Zambia, etc. The facilities available at this Institute for practical training include 5 fishing vessels, 3 at Cochin and 2 at Madras. The entrants in courses for Fishing Second-hands, Engine Drivers and Shore Mechanics have to have either SSLC or at least eighth standard with 5 years' fishing experience; for Boat Building Foremen the same educational qualifcation is required but with 5 years' experience in boat building yards; for Gear Technician and Radio Telephone Operator the minimum qualification is SSLC but no previous experience. A teacher training course is offered in the CIFO, which awards certificates to successful candidates.

53.8.15 The only other institute which imparts fisheries education leading to Bachelor's and Master's degrees is the College of Fisheries at Mangalore of the University of Agricultural Sciences, Bangalore. The two-year B.F.(Sc.) course is equivalent to a similar course at CIFE. The college has organised courses in fishery biology, marine biology, oceanography, fish culture and fish processing technology. The technological facilities regarding canning and sausage making, which have come from the former Indo-Japanese Marine Products Processing Training Centre, are of a high order but well equipped research stations and vessels are yet to be provided.

53.8.16 Short term courses in fish handling and freezing are offered at the Integrated Fisheries Project under the Ministry of Agriculture and Irrigation and the Central Institute of Fisheries Technology, Cochin (ICAR).

53.8.17 From the account given above the points that emerge in respect of fisheries education in India are: An institutional structure for imparting instruction in fisheries at the postgraduate diploma and certificate levels has been built up. No worthwhile programme of fishery education at the degree level has so far been taken up by universities which could ensure the appropriate standards of teaching and research on an all-India basis. Research institutes in fisheries have at best organised some courses of training but they are hardly adequate, commensurate with the required quantity and quality of the trained personnel.

53.8.18 In the light of the above general findings, we examined the feasibility of strengthening and reorienting the existing institutions so that they are able to cater to the needs of the country in regard to all aspects of fisheries education. For instance, the CIFE, if suitably strengthened and expanded would be in a position to offer degree courses at the B.Sc and M.Sc levels. Because of the transfer of the three fisheries institutes to the ICAR which offers better salaries, the CIFE is in difficulty in retaining its staff in position. To undo this situation, and in view of the ICAR's responsibility in agricultural education, it is recommended that CIFE should also be transferred to the ICAR, thereby making it at par with the other fisheries institutes. The other training centres mentioned earlier, e.g. CIFO may be similarly strengthened with staff and physical facilities to make them more effective and useful. This is no doubt

highly desirable and should be properly attended to. In spite of all the above additions to the existing infrastructure, these institutions would fall short of fulfilling the needs of fisheries education in the country.

53.8.19 With the emergence of agricultural universities in which research, teaching and extension education are integrated, the role of research and technology institutes in the matter of agricultural education has been of secondary importance. Because of the academic climate which prevails in universities, they should be entrusted with all kinds of education. As part of agricultural education, fisheries education should, therefore, be imparted in the agricultural universities. Taking into account the special physical facilities required for fisheries education, particularly marine fisheries education, it is necessary and desirable to take advantage of the facilities available in some of the general universities, in the maritime region, e.g., Cochin and Bombay. Calcutta and Madras universities may in course of time develop in this manner. Some of the agricultural universities have started marine fisheries education as has been done at the College of Fisheries, Mangalore by the University of Agricultural Sciences, Bangalore but most others are not physically endowed with the required facilities. Most of them would, no doubt, be in a position to start inland fisheries education if the existing facilities are suitably strengthened but it would be wasteful for each and every agricultural university to start a fishery faculty. The ICAR may select a few universities for supporting fisheries education, only

agricultural universities for inland fisheries and that too on a regional basis, and the Universities of Cochin and Bombay and the University of Agricultural Sciences, Hebbal(Mangalore College) for marine fisheries. Courses in fisheries at universities should be opened only after careful examination by expert groups constituted by the ICAR. We would like to make some suggestions in this connection. The graduate level courses, whether with a marine or with inland fisheries bias can develop on a regional basis, taking into account the special needs of the region where a university is located. This is specially so in inland fisheries. The postgraduate courses whether following from inland or marine fisheries graduate training should have an all-India basis, and a strong common fisheries bias, although specialisation in a particular field may be provided for. This is necessary to provide for recruitment, placement and interchangeability of personnel at senior levels. The universities in the maritime region whose role in marine fisheries education has been accepted should concentrate on subjects auxiliary or basic to marine fisheries rather than start general fisheries courses. Owing to the dichotomy in the training requirements for inland and marine fisheries, the sharp difference in education for senior level personnel and the training for the wide variety of skilled personnel at the operative level, we are aware of the difficulties in fully dealing with the situation in the existing framework. Fishery experts associated with our Working Groups and

Committees have strongly advocated the institution of a national fisheries university of the Japanese pattern or like the Sea Grant Colleges of the USA. This may be considered as a goal to be achieved in course of time but the time is not yet ripe to launch on such a university. The existing institutions should, however, be utilised for collaborative research by the universities and for certain short-term special courses for which these institutions are well equipped. A list of the institutes together with the existing specialisations in each is given below:

CIFE, Bombay	biochemistry and microbiology of fish, fisheries economics, marketing and cooperation, fish culture.
CIFT, Cochin	fish processing, quality control, gear technology, boat design.
NIO, Panaji & Bombay	oceanography (physical and chemical), marine pollution.
CIFRI, Barrackpore	fish culture, parasitology.
Oceanography Laboratory, Cochin University	marine biology, oceanography.
CMFRI, Cochin	marine fisheries resources, mariculture, population dynamics, fishery statistics.
CFTRI, Mysore	food processing and packaging technology.

53.8.20 The scope of the B.Sc.(Fisheries) and M.Sc.(Fisheries) in the matter of their course contents and duration have to be decided by the respective academic bodies. In a general sense the duration should be the same as that of the other agricultural sciences. Like animal sciences fisheries graduates (B.Sc.) would need additional

practical training for a period of six months or so, after the completion of the degree course. There would be no specialisation at the graduate level, but every student must compulsorily have an elective subject in the final year, such as fish ~~culture~~, fish technology, fish processing, fish marketing, fisheries statistics, etc. The practical training should be preferably biased towards the elective subject. Such practical training would be particularly useful for those who do not plan to prosecute further studies in fisheries. Students qualified for the B.Sc. degree would be suitable for recruitment to general posts in fisheries departments requiring a degree qualification.

53.8.21 The M.Sc. (Fisheries) degree course should include all aspects of fishery science included in the B.Sc.(Fisheries) degree course but at an advanced level and in addition provide specialised instruction in certain elective subjects. The duration should be not less than two years after the B.Sc. (Fisheries) degree. The M.Sc.(Fisheries) qualified candidates should meet the needs of fisheries personnel at the higher level and those requiring specialised knowledge of particular fields such as inland fisheries, fisheries technology, fisheries administration and management, etc. They should also be in a position to take up research at the level of Research Assistants, Senior Scientific Assistants, etc. at the fisheries research institutes such as the Central Marine Fisheries Research Institute, Central Institutes of Fisheries Technology, National Institute of Oceanography, etc.

53.8.22 With the introduction of Bachelor's Degree in fisheries the question of its linking with postgraduate training leading to the B.Sc degree in fisheries arises, particularly whether such a fisheries degree should be an essential prerequisite for admission to the M.Sc course. It has been experienced that a good degree in one of the sciences related to fisheries followed by adequate training for a period of two years can very well serve the needs of the managerial and executive posts in fisheries. We are, therefore, of the view that preference should be given to fisheries graduates, but those from other sciences such as zoology, should not be prevented from admission to the M.Sc course. However, an orientation course for such students in fisheries disciplines should be obligatory. However, as specialists have necessarily to be drawn from several basic disciplines such as biochemistry, statistics, economics, etc., it is desirable to keep doors open to candidates having degrees in these subjects.

Training of Research Workers

53.8.23 The training of research workers who would after sufficient experience serve as specialists in different aspects of fisheries science needs special attention. Research workers are the scientists and technologists who are trained to investigate the diverse problems in fisheries which need solution. The agricultural universities and such general universities as would have fisheries courses as stipulated earlier (Paragraph 53.8.19) should be the place for training research workers, as it is so for other agricultural sciences. The training should

normally lead to a Ph.D. degree and the duration should not be less than two years after the M.Sc. (Fisheries) degree.

53.8.24 Before the recommendations are made in regard to the starting of B.Sc.(Fisheries), M.Sc.(Fisheries) and Ph.D(Fisheries) courses in the agricultural universities and some of the general universities in the maritime region, special attention should be paid to the existing status of fisheries education in the country, special needs of the country in regard to fisheries education and research and those of the fisheries industry. We recommend that the universities concerned or the ICAR should constitute a special committee to frame the syllabi and curricula in the light of the proposed changes. This committee should look into the question of entrance requirement, core and elective subjects, duration of study, practical training, internship, etc. The committee should be so constituted that the ICAR, UGC, State Governments, fisheries institutes and the fisheries industry are represented.

53.8.25 Extension services have an essential role in fisheries development particularly in a developing country like India. Extension workers are the link between the Government and fishing industry as well as the fishing communities. The education and training of extension workers, therefore, deserve special consideration. It has been realised that considerable advances have been made in the technologies related to fish production through induced breeding, intensive and composite fish culture, utilisation of fish, etc. During the last two plan periods their application in practice has, however, been held up for want of appropriate extension work. The Government

of India has already established a centre at Hyderabad for training Extension Officers in work connected with fish culture. Another centre for the training of Extension Officers in work connected with handling, preserving and utilisation of fish, etc. in the marine sector has been proposed but not yet set up. For the benefit of the fishing industry, forecasting and advisory service have also been planned in the near future. This extension training centre for the marine fisheries sector should be established immediately. The basic level of education for fisheries extension workers at the senior level would most appropriately be the two-year diploma course conducted at the CIFE, Bombay. Further training needed is in the field of extension methods and extension techniques. The extension worker must firstly be well informed in the particular field, and, secondly, must have practical knowledge on the subject besides the techniques involved. The areas in which an extension worker is called upon to render advice are wide-ranging and include technical expertise, financing, management and even social problems. He has always to be abreast of the latest developments and ahead of the industry in the range of products and diversification.

53.8.26 The training centre at Hyderabad and also the proposed second centre for the marine fishery sector must be staffed with experienced teachers and instructors, and provided with all the necessary teaching and extension equipment and instruments etc. to make training courses effective and purposeful.

Fishery Engineers

53.8.27 Persons with basic knowledge of engineering are required in different fields of fisheries activities, besides the marine engineer needed for operation and maintenance of large fishing vessels. These are the personnel concerned with planning and construction of fish farms, enclosing estuarine and brackishwater areas for fish culture, reclamation of swamps for use as fish farms, management of reservoirs etc. Another category consists of engineering personnel for the refrigeration sector such as cold storages, freezing plants, ice-making plants, refrigerated and insulated transports; still others are required for supervising and operating canning, filleting and other fish processing machinery. A separate category includes persons trained as naval architects for the design and construction of fishing vessels.

53.8.28 Marine engineers are trained at the Nautical colleges under the Ministry of Transport situated at Bombay and Calcutta. The trained marine engineers have to acquire experience and be familiar with the operating needs of fishing vessels.

53.8.29 Naval architects are trained at th IIT, Kharagpur. A new degree course in the subject has been started at the Cochin University. However, these persons with the academic training have to acquire knowledge of the special requirements of fishing vessels with respect to operation and handling of different fishing gear and different sea conditions.

53.8.30 For work connected with fish farm construction etc. engineers with a basic degree in civil engineering are most suitable; but they need experience in handling projects concerned with the planning, construction and maintenance of fish farms; also in engineering aspects of the construction of reservoirs and dams, providing for fish pathways (fish ladders), problems concerning the pollution of aquatic environments through influx of various types of effluents, etc.

53.8.31 For the operation and maintenance of refrigeration plants and machineries engineers with a basic degree in electrical engineering would be suitable. They must acquire practical experience in refrigeration, fish preservation and processing industry.

53.8.32 The need for engineering personnel of the above different categories is acutely felt in implementing several programmes in fisheries development in the country. If suitable expertise is made available in the country the implementation of the development programmes could be speeded up substantially. While there are adequate facilities for the training of engineers in the basic subjects such as marine engineering, civil, electrical and mechanical engineering and in naval architecture there is need for providing regular facilities for suitable persons to obtain knowledge and also on-the-job experience in the fisheries field. Such facilities could be provided at the different fisheries institutions and organisations existing in India. Naval architects could obtain experience at the CIFT, Cochin; marine engineers could have experience in fishing

projects and industrial practices where large size fishing vessels are operating regularly in offshore waters; practical experience for refrigeration engineers could be provided at the cold storage and freezing plants of the State Fisheries Departments and fisheries corporations etc. at Cochin, at Bombay and also at the Marine Products Processing Training Centre under the Fisheries College at Mangalore.

53.8.33 Gear technicians and Electronic Engineers for fishing industry should be drawn from Mechanical Engineers and Electronic Engineers and given specialised training at CIFT and at institutions handling marine electronic equipment.

Inservice Training
for Fishery Personnel

53.8.34 : Properly planned programmes for training such personnel as field assistants, required for assisting in various aspects of fisheries research, production and utilisation are also important. Some of these personnel need training at the higher secondary or polytechnic level; others will need training at the diploma level/intermediate level. In Planning for the education of this nature provision for such personnel to acquire higher qualification at the degree level, after gaining suitable experience in the job should be made.

53.8.35 As mentioned in Chapter 38 on Marine Fisheries, courses for training marine fishing operatives which are being conducted at the CIFO at Cochin and Madras are generally adequate. The intake capacities should be increased in due course to meet the requirements of the country.

53.8.36 The courses of training for inland fisheries operatives conducted at the Central Regional Training Centre at Agra have been useful but there are difficulties with regard to the medium of instruction. In order that training is imparted in the regional language, training courses for inland operatives need to be decentralised. The training may preferably be arranged in polytechnics or KVKs along with other agricultural subjects. Adequate teaching staff and necessary physical facilities for field work should be ensured before such courses are started. Till such provisions are available the Central Regional Training Centre at Agra may continue.

53.8.37 Inservice training of higher level functionaries has been mostly in foreign countries taking advantage of the various fellowships/training schemes of FAO, UNESCO, UNDP, Colombo Plan, etc. as no organised training programmes exist in the country. With the setting up of the Indian Institute for Agricultural Administration and Management as recommended in Chapter 62 on Administration, some facilities for inservice training of management personnel at the higher

level are expected to become available along with othor disciplines. Still there would be need for organising inservice technical training programmes for the higher level functionaries. Such a training programme should be the responsibility of the Central Government.

9 SUMMARY OF RECOMMENDATIONS

53.9.1 The following is a summary of the important recommendations made in this chapter:

1. We reiterate the recommendation of the Education Commission regarding an agricultural orientation at primary and secondary school levels and recommend that the text books on general sciences should be written and the existing ones revised.

(Paragraph 53.3.3)

2. Education in Home Science should form an integral part of the general education for all children upto the middle stage.

(Paragraph 53.3.4)

3. There is urgent need for organising sound vocational and technical training in agriculture for intermediate level workers (men and women) through appropriate non-degree educational programmes.

(Paragraphs 53.4.2 & 53.4.10)

4. Vocational education should be available more easily to the small and marginal farmers who are hard pressed for land and require greater technological guidance to increase productivity of their farms.

(Paragraph 53.4.9)

5. For the sake of expediency some of the KVKs for trainer's training may be associated with the research institutes but as a long-term policy they should be attached only to the agricultural universities. Some of them may also be operated, in consultation with and with the approval of

the State Government, by voluntary agencies having reputation for public service.

(Paragraph 53.4.13)

6. Each of the krishi vigyan kendras should have academic freedom to develop its own programmes in conformity with the needs of the area in which it is situated. Evaluation should be a built-in component of the krishi vigyan kendra to review, revise and improve the courses in conformity with the need of the region, type of trainees and development programmes.

(Paragraph 53.4.14)

7. Some programmes of nonformal vocational education suitable for the people of tribal areas should be formulated, which in several respects may have to be different from the ordinary run.

(Paragraph 53.4.15)

8. As a follow up measure of the training the trainees not absorbed in jobs should be provided with loans, marketing, extension and farm input services, as a step towards self-employment.

(Paragraph 53.4.16)

9. For the vocational education infrastructures of existing institutions should be utilised, as far as practicable. For the vocational courses meant for women trainees, women teachers should preferably be appointed.

(Paragraph 53.4.17)

10. For the success of vocational education programmes, it will be advisable to give preference to those who have

graduated from the polytechnics and vocational agricultural schools and have appreciable farm experience.

(Paragraph 53.4.17)

11. There should be ample opportunity and provision for continuation and development in academic skill and aptitudes, so that apart from ensuring a flow of skilled operatives for the agricultural services, the best and the most gifted students could continue their training at the higher level.

(Paragraph 53.4.20)

12. Coordination of nondegree agricultural education programme could best be ensured by an apex body consisting of representatives of the ICAR, Directorate of Extension at the Centre. Ministry of Education and Social Welfare (NCERT), Ministry of Labour, Ministry of Health and Family Planning and selected technical heads of the State Departments.

(Paragraph 53.4.21)

13. The responsibility for follow-up activity, guiding, supporting, and assisting the field activities in connection with youth programmes and developing nonformal educational activity at the block level should be that of the block authorities.

(Paragraph 53.4.22)

14. There should be only one agricultural university in a State, having if necessary autonomous campuses in suitable locations. Each of such campuses should have a pro-vice-chancellor as its executive head, having the same powers in the campus as the vice-chancellor of the main

university. All such campuses should be under one academic umbrella.

(Paragraph 53.5.8)

15. The Board of Management of the university should have members who are committed to academic principles and would be prepared to give more of their time and experience for the development of the university.

(Paragraph 53.5.9)

16. The substandard colleges should be abolished and be reorganised into krishi vigyan kendras or centres of vocational education.

(Paragraph 53.5.14)

17. The Dean of the faculty/college who is incharge of teaching, Director of Research and Director of Extension should be jointly responsible for an integrated function of the three activities within the overall purview of the subject matter.

(Paragraph 53.5.17)

18. The inclusion of student representatives with limited participation is the best possible means of getting across students' ideas in the administration of universities in which they are the most vital and important constituent.

(Paragraph 53.5.18)

19. Universities should provide not only the needed practical training as a part of the curriculum but also some well planned activities of learning by doing, aimed at creating practical competence and confidence. To ensure these activities for students, it is necessary to have an organisation of student welfare and services.

(Paragraph 53.5.20)

20. Undergraduate curricula should be developed with a core component emphasising fundamental principles with ability to solve problems as they arise, with electives in production-oriented areas like crop production, farm management, farm machinery and power, soil and water conservation, agricultural communication, etc.

(Paragraph 53.5.22)

21. Instead of prolonging the training period of undergraduates as it happens in internship training, the practical training required for either self-employment or professional employment should be built into the course, except in cases like animal sciences and fisheries.

(Paragraph 53.5.27)

22. Bachelor degree programmes in basic sciences and humanities need not be started in agricultural universities. Postgraduate programmes in selected disciplines in basic sciences which would provide the necessary support to advance research work in agriculture may be taken up.

(Paragraph 53.5.28)

23. Periodical checks on the grading by the individual teachers/teaching departments should be enforced for some time to come to remove the doubts about the fairness of internal evaluation.

(Paragraph 53.5.32)

24. The agricultural universities' staff including those of research and extension should accept, as a part of their academic responsibility, the preparation of suitable text books.

(Paragraph 53.5.33)

25. It would be desirable for the universities and employing agencies to confer regarding modification of courses or introduction of new ones, keeping an eye on employment opportunities. The agricultural universities may also think of short-term courses to meet the needs of employer.

(Paragraph 53.5.34)

26. The ICAR should insist creation of an inter university task group which would study the employment opportunities of agricultural graduates and formulate necessary action programmes.

(Paragraph 53.5.37)

27. The universities should organise an efficient placement service to provide a link between the graduates and their prospective employers by publishing and circulating directory of their graduates.

(Paragraph 53.5.38)

28. The universities must have a system of transfer of academic credits from one university to the other.

(Paragraph 53.5.39)

29. The agricultural university should develop linkages with agencies which supply the necessary inputs to agriculture.

(Paragraph 53.5.41)

30. The agricultural university should work with the State manpower bodies so that manpower planning may be related both quantitatively and qualitatively to changing employment needs and opportunities. It would similarly be necessary to work with manpower cells of agencies in the private sector concerned with agriculture.

(Paragraph 53.5.42)

31. For improving the standard of university education and arming the state with adequately trained personnel for developmental work, the universities and research institutes should come together and formulate training programmes and implement them jointly, with a clear understanding of purpose and complementarity.

(Paragraph 53.5.43)

32. Collaboration for improving the standard of postgraduate research should be fostered between the agricultural universities and general universities.

(Paragraph 53.5:44)

33. It would not be proper in the best of university tradition to conduct any commercial enterprises for increasing financial resources.

(Paragraph 53.5.45)

34. The State Government should fix block grants for the university making a practical and realistic assessment of requirements of the funds for efficient management of its programmes for a period of five years giving complete freedom to the university to regulate the expenditure within the grant without any preconditions. An automatic annual increase of 5-10 per cent in block grant should be allowed on the previous grant for normal rise in almost all the items of expenditure.

(Paragraph 53.5.45)

35. The State Government should be prepared to give matching grant to take over the entire liability of educational and research programmes financed initially by the ICAR, and to provide separate grant for the maintenance

of all facilities namely college buildings, laboratory and library buildings and other physical facilities constructed with the financial assistance of ICAR following State PWD norms, and also to provide sufficient 'foundation grants' for agricultural universities.

(Paragraph 53.5.46)

36. Ten to twenty percent of the total plan outlay under the agricultural development programmes should be earmarked in the State budget for agricultural education and research.

(Paragraph 53.5.46)

37. We endorse the guidelines in respect of ICAR assistance as suggested by vice-chancellors of agricultural universities and examined by the ICAR's Norms and Accreditation Committee.

(Paragraph 53.5.47)

38. For education and training of women, educational infrastructure at the middle and lower levels should be developed. The women's training centres should be strengthened and those closed should be revived. This programme should be brought under the integrated department of agriculture.

(Paragraph 53.6.4)

39. Since the number of VLWs (men and women) and other functionaries needed at the village level is very large, all the Gramsevak/Gramsevika training centres, agricultural schools and other similar training institutes should concurrently run inservice training courses for them. For this purpose the centres of training should be equipped with adequate qualified teachers and uptodate teaching materials.

(Paragraph 53.6.5)

40. Since modern farming involves managerial skills for efficient use of land, labour, water and other necessary inputs, farm management specialist should be posted at each Gramsevak/Gramsevika training centre. To impart adequate practical training to VLWs each Gramsevak training centre should be allotted not less than 20 hectares of land with reasonable irrigation facilities. Necessary steps should therefore be taken to provide this facility at centres where they do not exist. Where new centres are to be set up, it would be desirable to locate them at the available seed farms.

(Paragraph 53.6.6)

41. It would be desirable for each State Government to draw up a phased programme for deputation of its staff for inservice training. For maintaining quality and imparting uptodate knowledge to the trainees the agricultural universities should be suitably involved either by arranging for classes there or having university experts on short-term deputation to the training centres. A joint training board suitably represented by the relevant training institutions, faculties of universities and State Departments should formulate training programmes, organise the curricula and courses and set norms of evaluation of the trainees. The agricultural universities should be given the responsibility of the training programmes of the trainers.

(Paragraph 53.6.8)

42. Considering that the inservice training of

extension officers is to be repeated after every 3 years, to keep pace with modern technology, it is imperative that all the agricultural universities and colleges should develop appropriate training facilities for officials of all categories.

(Paragraph 53.6.10)

43. There is need to review the working of the summer institutes and to find out to what extent the intended benefits accrue in reality, commensurate with the financial commitments involved.

(Paragraph 53.6.12)

44. It may be ensured that the trained persons are retained where they are most useful.

(Paragraph 53.6.13)

45. There is lack of adequate and reliable data about current manpower situation, namely, staffing pattern, classification of jobs, number of persons who have received inservice training etc. The concerned subject matter departments/organisations instead of a central agency, should, in our opinion, be made responsible for collection and analysis of these data for their own use and benefit. The data may be centrally pooled in the ministry for purposes of information and for correcting regional imbalances, if any.

(Paragraph 53.6.14)

46. In regard to division of responsibility for organising training programmes, following recommendation made in our Interim Report on SAARET is reiterated. Joint training board may be constituted at the State level with

an officer of the rank of a Joint Director as convenor to look after the training programmes of departmental junior staff members, field functionaries and farmers, and the agricultural universities should organise periodical training of top and middle level administrators and experts of Government Departments.

(Paragraph 53.6.15)

47. The expenditure for training should be earmarked and placed at the disposal of training centres with the provision that the same allowances and amenities are enjoyed by the trainees irrespective of the States which they come from.

(Paragraph 53.6.16)

48. Animal production should be treated as an independent major subject. Veterinary science should also be developed to a high standard simultaneously.

(Paragraph 53.7.28)

49. Education in dairying should be integrated with the mainstream of educational programme in animal science and organised in agricultural universities. Central Government should grant financial assistance to selected agricultural universities agreeing to initiate such programmes.

(Paragraph 53.7.29)

50. The National Dairy Research Institute should divest itself of the Indian Dairy Diploma and the Bachelor's degree course training in dairying as soon as possible.

(Paragraph 53.7.30)

51. For better commercial exploitation of different ainmal products, education not only in dairy technology but also in technology of other animal products should be developed expeditiously.

(Paragraph 53.7.31)

52. Educational programmes in animal science should be developed in agricultural universities under a single faculty.

(Paragraph 53.7.32)

53. Training course in dairy production should be integrated with the educational programme in animal production but dairy technology course should remain separate.

(Paragraph 53.7.33)

54. In the educational system in animal science, the following Bachelor's degree courses may initially be introduced (a) B.V.Sc., (b) B.Sc. (Animal Production), (c) B.Sc. (Dairy Technology), (d) B.Sc. (Meat and Poultry Product Technology) and (e) B.Sc. (Wool Technology).

(Paragraph 53.7.36)

55. Duration of study for the proposed Bachelor's degree courses should be more than four years. Additionally, internship or intensive practical training for a fixed period should be introduced.

(Paragraph 53.7.36)

56. Students in animal production should be provided with choice of elective courses pertaining to a particular species of livestock. Such courses may be pursued during the last six months of the study period.

(Paragraph 53.7.37)

57. A thorough revision and recasting of curricula and syllabi will be required for introducing reorganised educational programmes. The Indian Council of Agricultural Research or the Association of Agricultural Universities should constitute a special committee for this purpose.

(Paragraph 53.7.39)

58. Senior members of the teaching staff should also take practical classes. Lack of facilities for conducting practical work should be removed.

(Paragraph 53.7.40)

59. The ICAR should make a thorough and critical evaluation of the facilities for post-graduate education in animal science.

(Paragraph 53.7.41 & 53.7.42)

60. Specieswise Master's degree course in addition to the existing disciplinewise degree courses should be developed.

(Paragraph 53.7.44)

61. Should a student desire a change in the field of study at Master's degree level, there need not be any bar for enrolment provided he first earns the required credits in which he may be found deficient.

(Paragraph 53.7.45)

62. Central research institutes should undertake only the educational programmes that agricultural universities or other teaching institutions are at present unable to manage effectively.

(Paragraph 53.7.46)

63. Postgraduate certificate and diploma courses should be discontinued in the central research institutes when such programmes or degree courses in cognate subjects have been developed in other teaching institutions.

(Paragraph 53.7.46)

64. No postgraduate diploma should be awarded where facilities exist for award of degree courses in the same subject.

(Paragraph 53.7.46)

65. To ensure effective utilisation of university level education, apex bodies should be constituted in each State expeditiously.

(Paragraph 53.7.48)

66. Agricultural universities should reexamine the question of allocation of funds for education in animal science to ensure high standard of education and training.

(Paragraph 53.7.49)

67. Below-university-level training courses should be periodically reviewed by competent bodies. Provision of competent staff and teaching aids should be given adequate attention in these training programmes.

(Paragraph 53.7.51)

68. There is a need to establish 'intermediate' level educational programmes in all the three divisions of animal science with openings for subsequent university level education.

(Paragraphs 53.7.52 to 53.7.54)

69. Schemes should be drawn up and implemented for bettering the promotion prospects of and for providing incentives to the junior staff with below-university-level education.

(Paragraph 53.7.55 to 53.7.57)

70. The educational pattern at the Central Institute of Fisheries Education, Bombay, should be reoriented and facilities strengthened in order to cater for degree courses, both B.Sc. and M.Sc. in Fisheries Sciences, under the administrative control of the ICAR. The facilities and the staff at the Central Institute of Fisheries Operatives, Cochin, should also be strengthened to make it more effective and useful.

(Paragraph 53.8.18)

71. As part of agricultural education, fisheries education should be imparted in the agricultural universities. The ICAR may select a few universities for supporting fisheries education, only agricultural universities for inland fisheries on a regional basis, and the universities of Cochin, Bombay and Mangalore College of the University of Agricultural Sciences, Hebbal, for marine fisheries. Courses in fisheries at universities should be opened only after careful examination by expert groups constituted by the ICAR. The graduate level courses can develop on a regional basis, depending on the special needs of the region where a university is located, but the postgraduate courses should have an 'all-India basis', in order to

provide for recruitment,placement and interchangeability of personnel at senior levels.

(Paragraph 53.8.19)

72. The B.Sc. degree course in Fisheries should be of the same duration as other disciplines in agricultural universities, and should be without any specialisation but with an elective subject in the final year and additional practical training for six months after the completion of the degree course, preferably biased towards the elective subject. In the recruitment of middle level fisheries personnel, preference should be given to graduates in fisheries.

(Paragraph 53.8.20)

73. The M.Sc. degree course in Fisheries should cover, at an advanced level, all aspects of fisheries as included in B.Sc.(Fisheries), but with specialisation in an elective subject. The admission would ordinarily be open to graduates in fisheries only, but consideration should also be given to graduates in other subjects having bearing on fisheries, with initial compulsory orientation course in fisheries. In the recruitment of higher level personnel and research associates in fisheries, preference should be given to candidates with M.Sc. in fisheries.

(Paragraph 53.8.21 and 53.8.22)

74. Training and guiding research work, leading to Ph.D. degree in fisheries, should be conducted at the agricultural universities and such general universities as would have fisheries and allied courses.

(Paragraph 53.8.23)

75. The concerned universities, developing facilities for degree courses in fisheries education, should constitute a committee comprising representatives of the ICAR, UGC, State Governments, fisheries institutes and the fishing industry, to look into the question of entrance requirements, core and elective subjects, duration of study, practical training and internship.

(Paragraph 53.8.24)

76. The training of middle level extension workers should receive special attention, since extension has been a weak link in the fisheries developmental activities. The extension centre in inland fish culture at Hyderabad should be suitably staffed and adequately equipped, and the proposed extension centre in marine fisheries should be established immediately.

(Paragraphs 53.8.25 and 53.8.26)

77. Keeping in view the need for assistance in the diversified fields of engineering such as naval architecture, refrigeration, fish farm construction, electronic, electric and mechanical machinery, etc. orientation training biased towards fisheries should be organised at the existing fisheries institutions having the necessary facilities.

(Paragraphs 53.8.27 to 53.8.33)

78. Provision should be made for the training of field assistants employed in fisheries research, production

and utilisation centres at the secondary/polytechnic and at the diploma/intermediate levels, with opportunities to acquire higher qualifications at the degree level.

(Paragraph 53.8.34)

79. Training for inland fisheries operative has to be arranged at the regional, and even at the State level so that instruction can be imparted in the local languages. Arrangements for this training should be made at the krishi vigyan kendras (KVKs) and other polytechnics at the State level. Adequate teaching staff and training facilities should be made available through the Department of Fisheries.

(Paragraph 53.8.36)

80. Training of higher level functionaries in the fisheries organisation should be the responsibility of the Central Government.

(Paragraph 53.8.37)

APPENDIX 53.1

(Paragraph 53.7.44)

UNIVERSITY LEVEL EDUCATION

Faculty of Animal Science

Minimum entrance requirement for admission to graduate degree courses

Interscience or equivalent

	B.V.Sc.	B.Sc.(Animal Production)	B.Sc. (Dairy Technology)	B.Sc. (Wool Technology)	B.Sc.(Meat & Poultry Products Technology)
Duration of study and Training	Over 4 Academic year's study+ intern-ship for a specified period	Over 4 Academic year's study+ infarm training for a specified period	Over 4 Academic year's study+ inplant training for a specified period	Over 4 Academic year's study+ infactory training for a specified period	Over 4 Academic year's study+ inplant training for a specified period
Master's Degree	M.V.Sc. with specialisation(as Major) in subjects like Bacteriology & Virology, Pathology, Parasitology, Veterinary Public Health, etc.	M.Sc. with Specialisation(as major) in subjects like animal genetics, animal physiology, poultry science,etc.	M.Sc. (Dairy Technology)	M.Sc. (Wool Technology)	M.Sc. (Meat & Poultry Products Technology)
Duration of study and training	Not less than 2 academic years following attainment of Bachelor's degree.				
Doctorate Degree	Ph.D.	Ph.D.	Ph.D.	Ph.D.	Ph.D.
Duration of study and research	Not less than 2 academic years following attainment of Master's degree.				

SOURCES FOR FIGURES 1 - 20

1. Figures 1 to 4: Ministry of Agriculture and Irrigation (Department of Agriculture) 'Demand and Supply of Agricultural Technical Manpower' 1975 for years 1951-52 to 1972-73 and University Grants Commission (private communication) for 1973-74.

2. Figures 5 to 19: ICAR in case of enrolment and D.G.E.&T. in case of unemployment amongst agricultural graduates.

3. Figure 20: University Grants Commission (private communication).

FIG. 1 (PARAGRAPH 53.5.2)

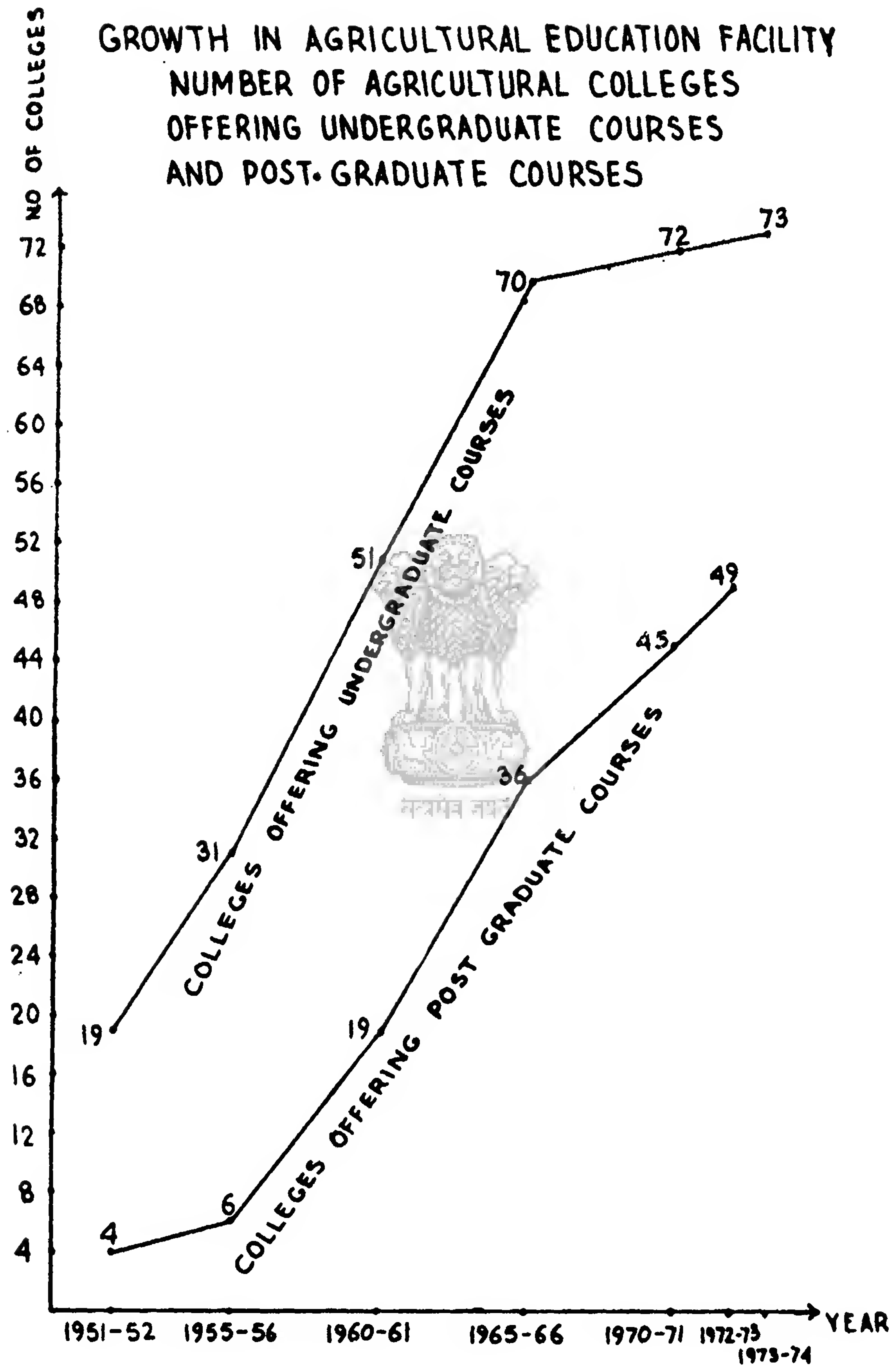


FIG. 2 (PARAGRAPH 53.5.2)

GROWTH IN VETERINARY EDUCATION FACILITY
NO. OF COLLEGES OFFERING UNDER GRADUATE AND POST GRADUATE COURSES

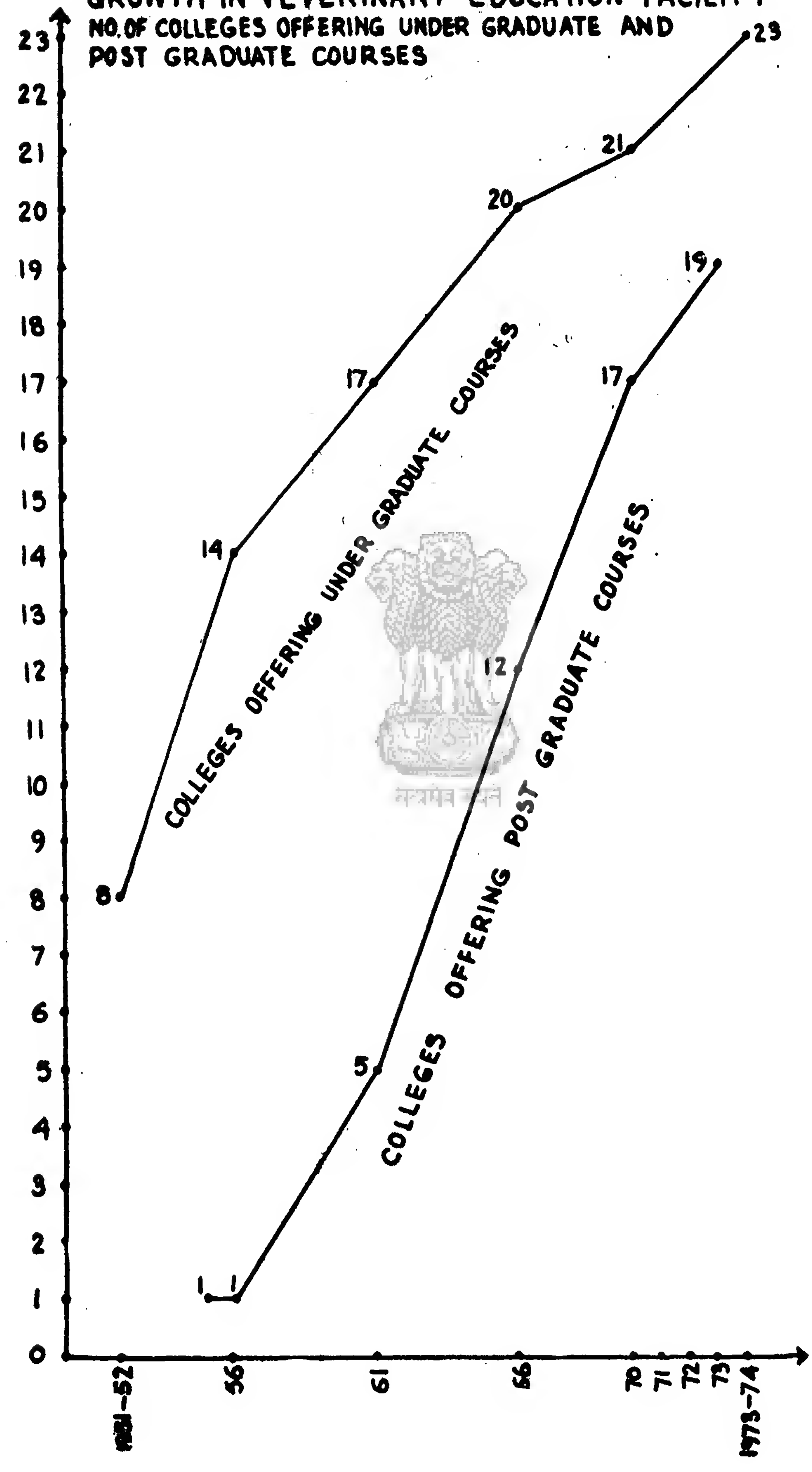


FIG. 3 (PARAGRAPH 53.5.2)

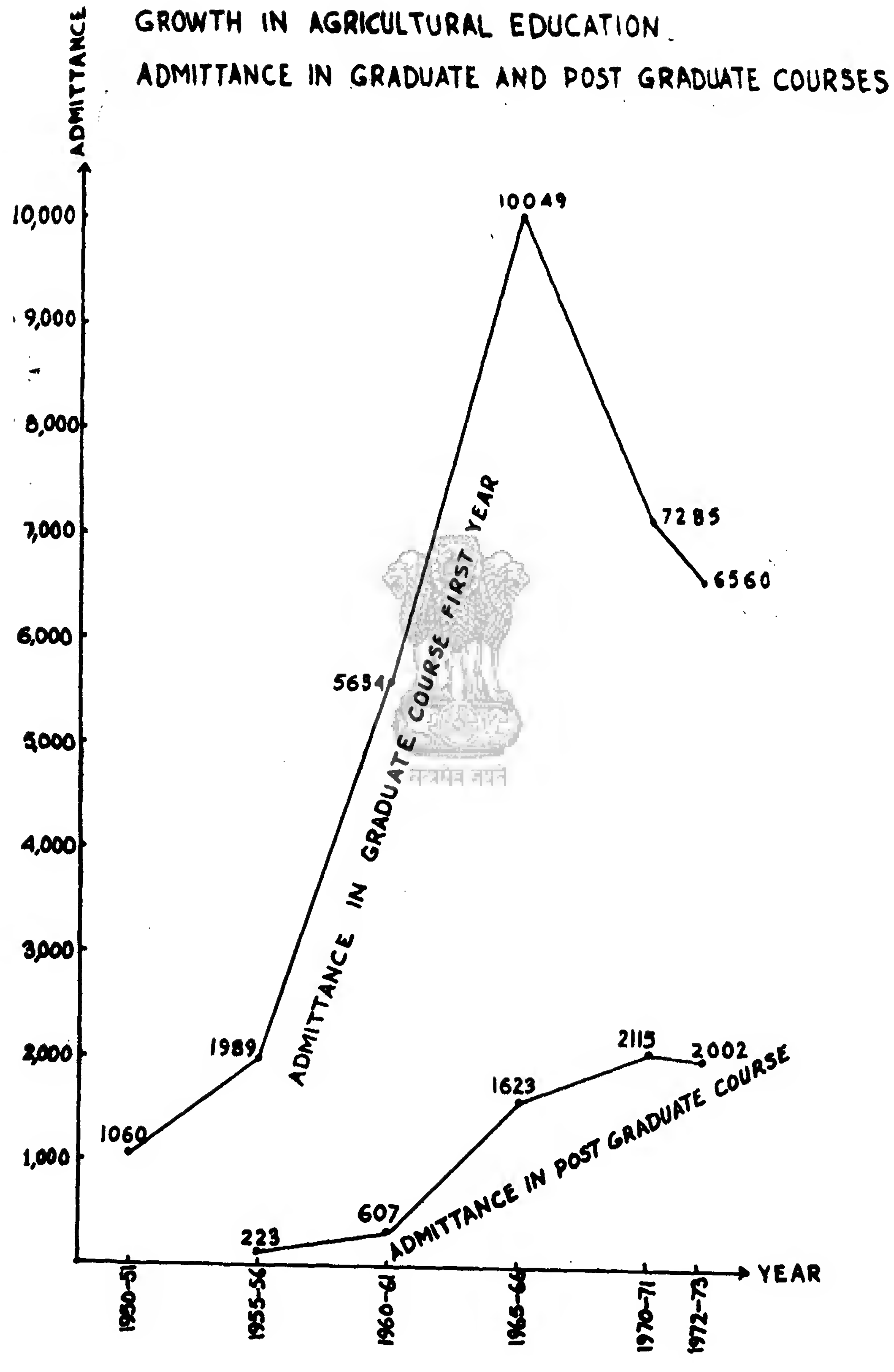


FIG. 4 (PARAGRAPH 53.5.2)

GROWTH IN VETERINARY SCIENCE EDUCATION

ADMITTANCE IN GRADUATE AND POST GRADUATE COURSES

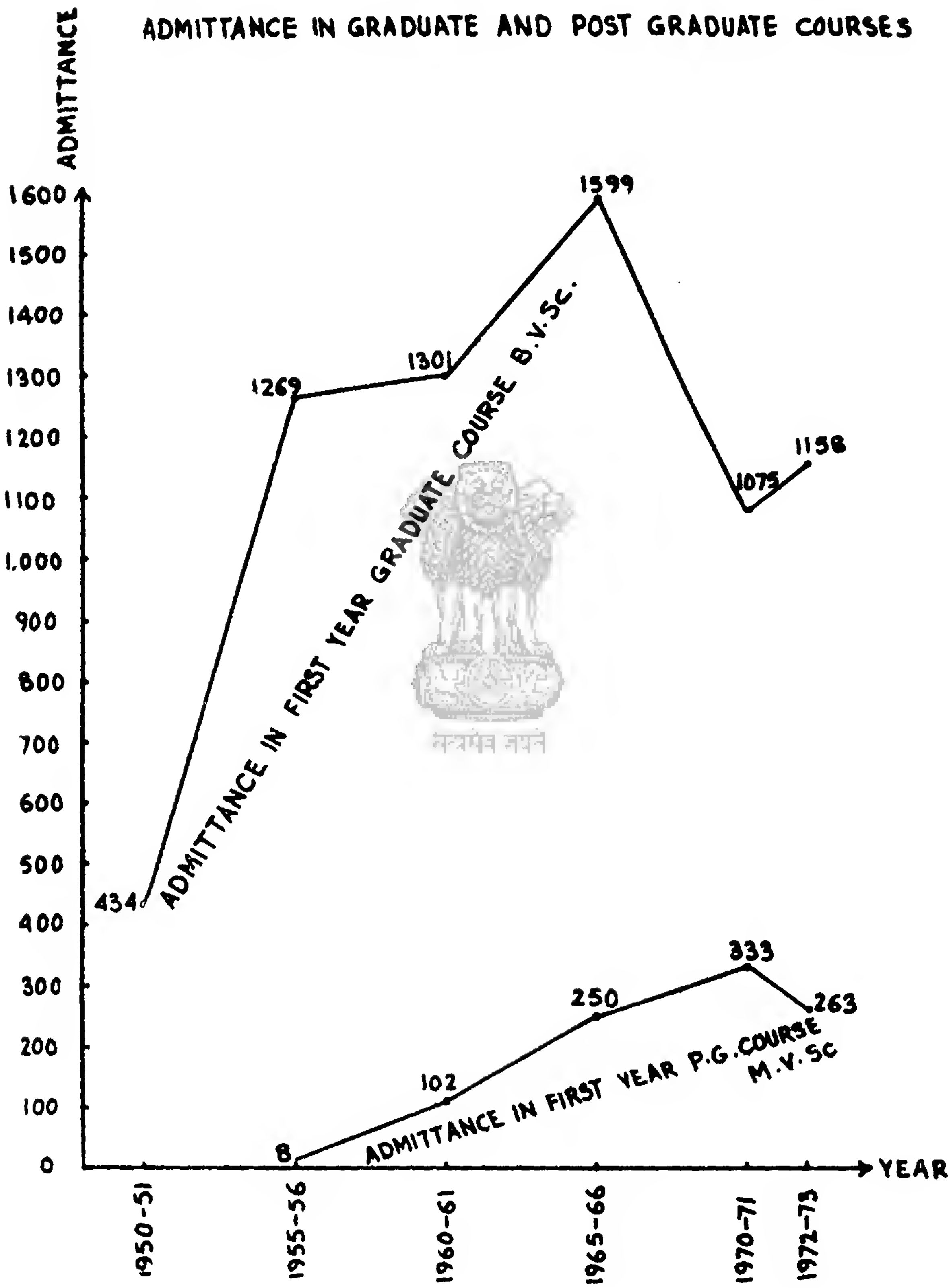


FIG. 5 (PARAGRAPH 53.5.4)

ANDHRA PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF ANDHRA PRADESH AGRICULTURAL UNIVERSITY AND UNEMPLOYMENT POSITION OF GRADUATES & POST GRADUATES.

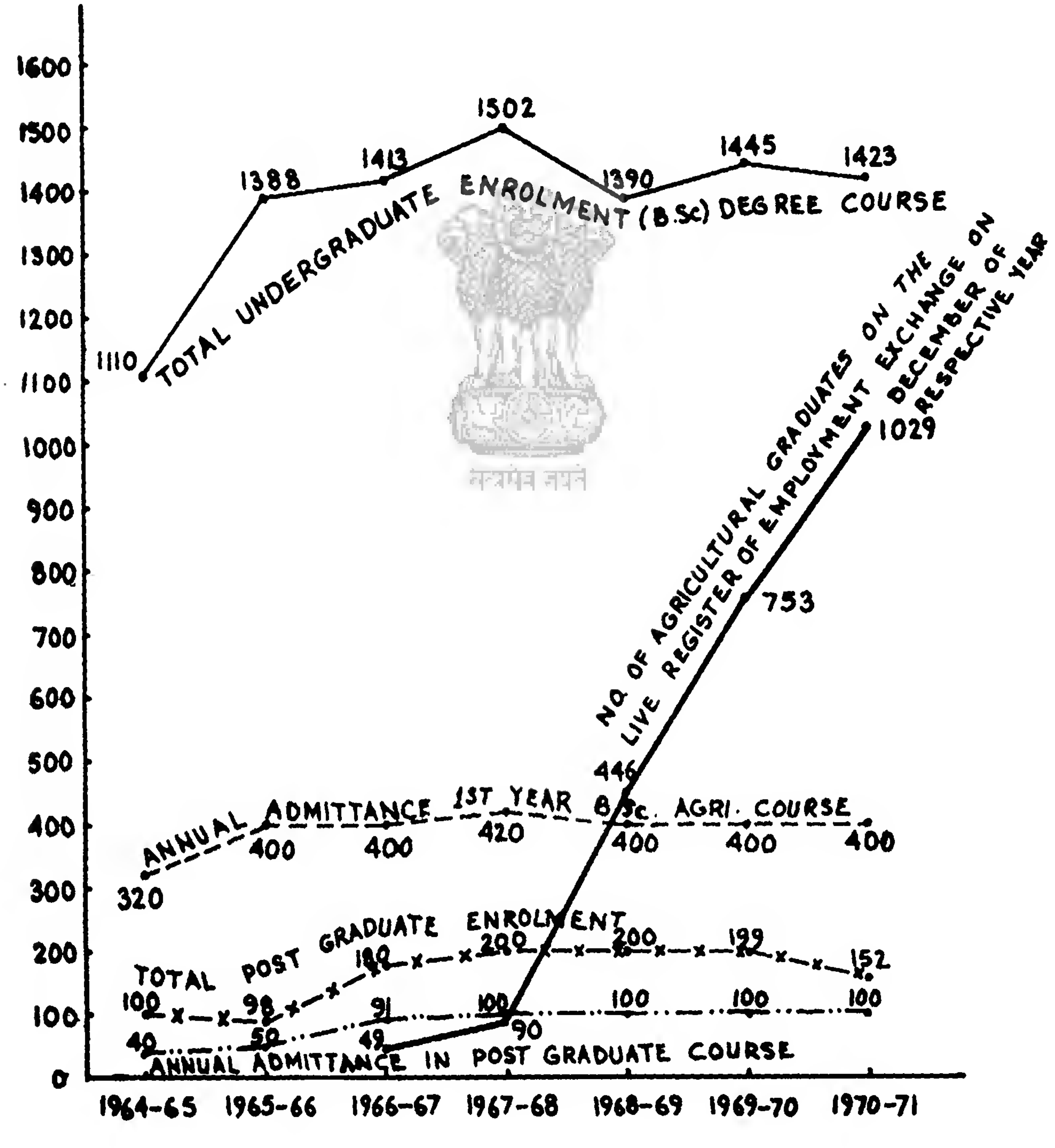


FIG. 6 (PARAGRAPH 53.5.4)

ANDHRA PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE IN THE COLLEGE OF VETERINARY & A.H. OF ANDHRA PRADESH AGRICULTURAL UNIVERSITY AND UNEMPLOYMENT POSITION OF GRADUATES & POST GRADUATES

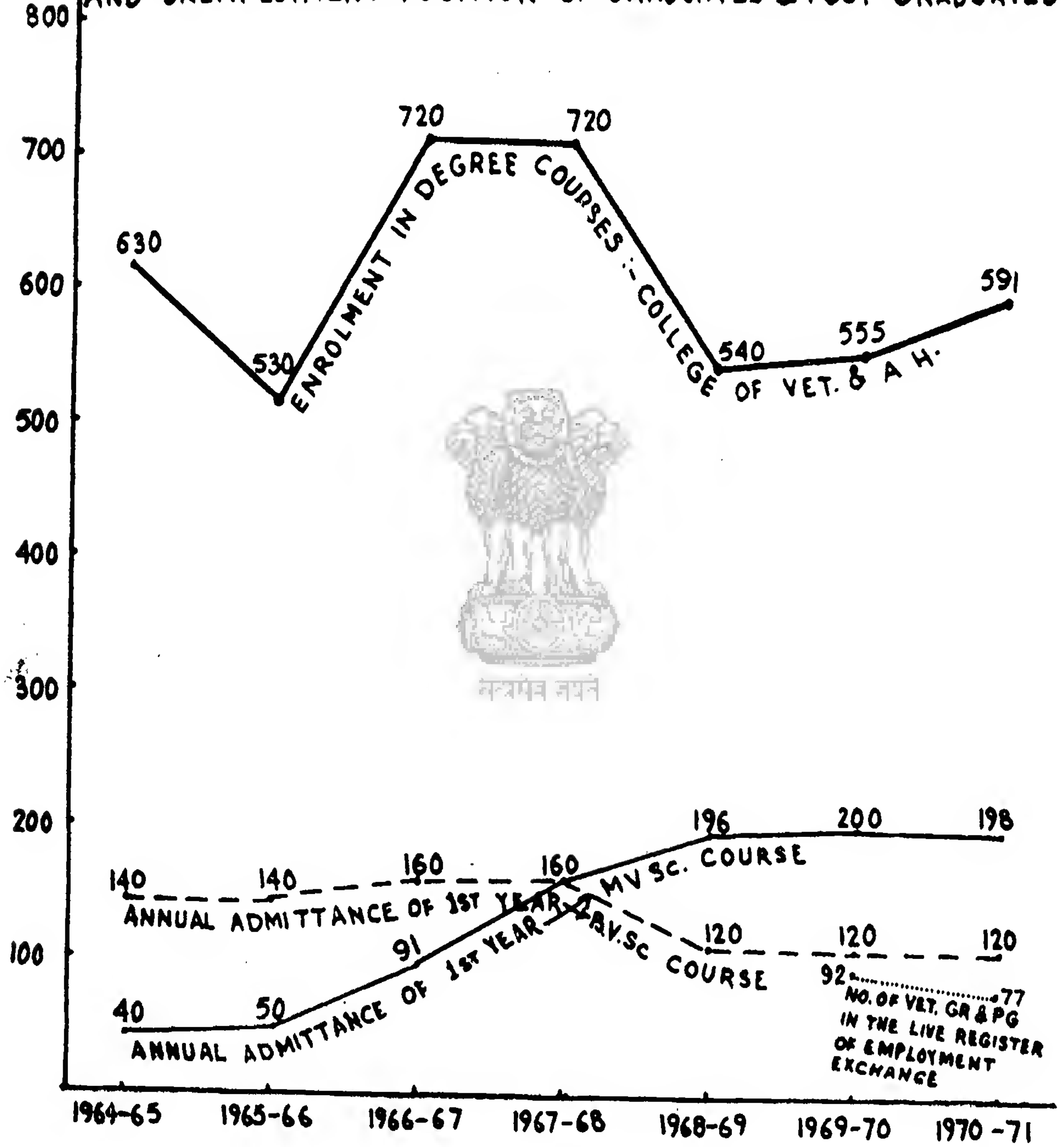


FIG. 7 (PARAGRAPH 53.5.4)

MAHARASHTRA

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF AGRICULTURAL UNIVERSITIES OF MAHARASHTRA STATE AND UNEMPLOYMENT POSITION OF GRADUATES & POST GRADUATES

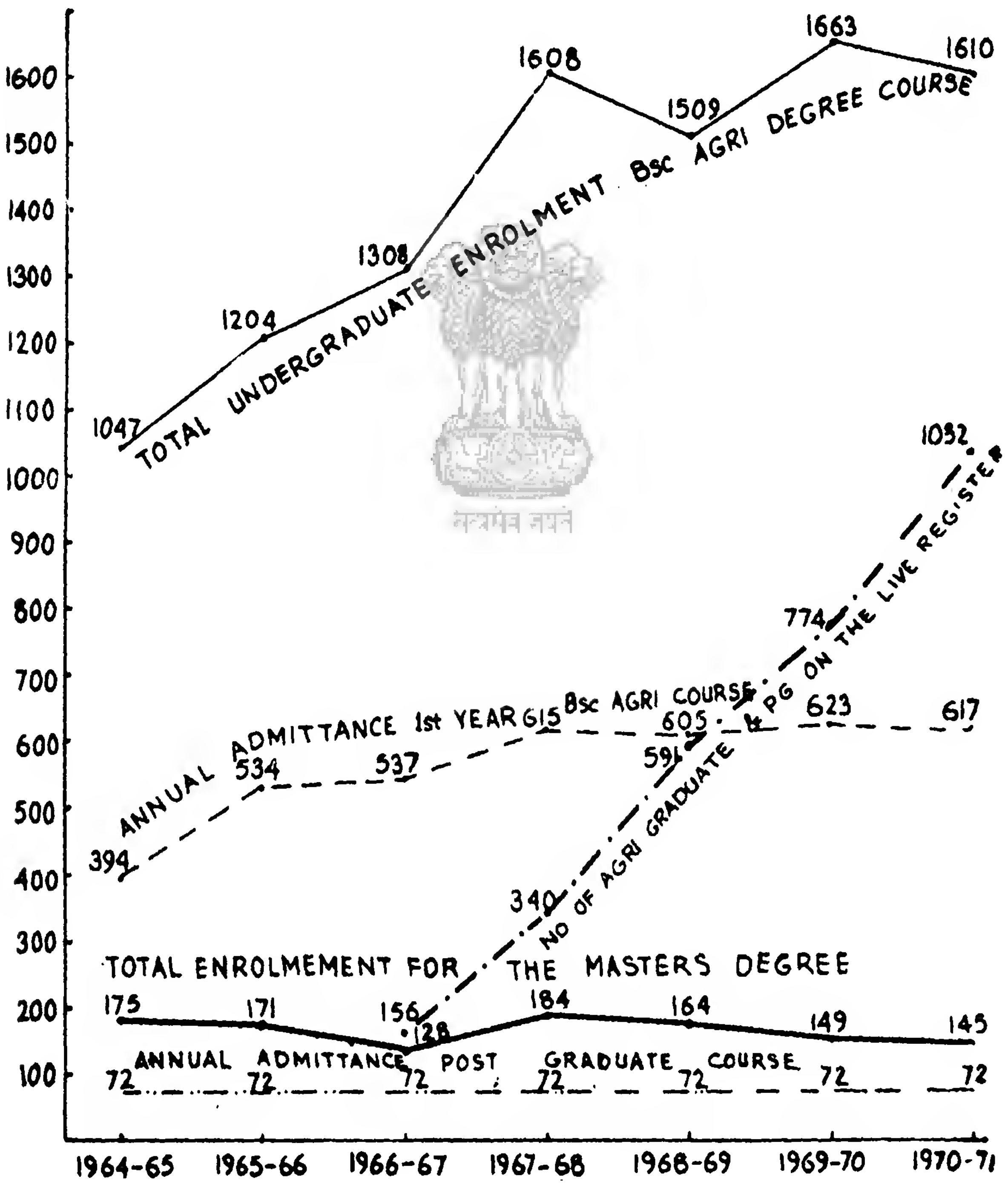


FIG. 8 (PARAGRAPH 53.5.4)

MAHARASHTRA

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN VETERINARY MEDICINE & ANIMAL SCIENCE COLLEGES OF MAHATMA PHULE KRISHI VIDYAPEETH AND UNEMPLOYMENT POSITION OF GRADUATE AND POST GRADUATES

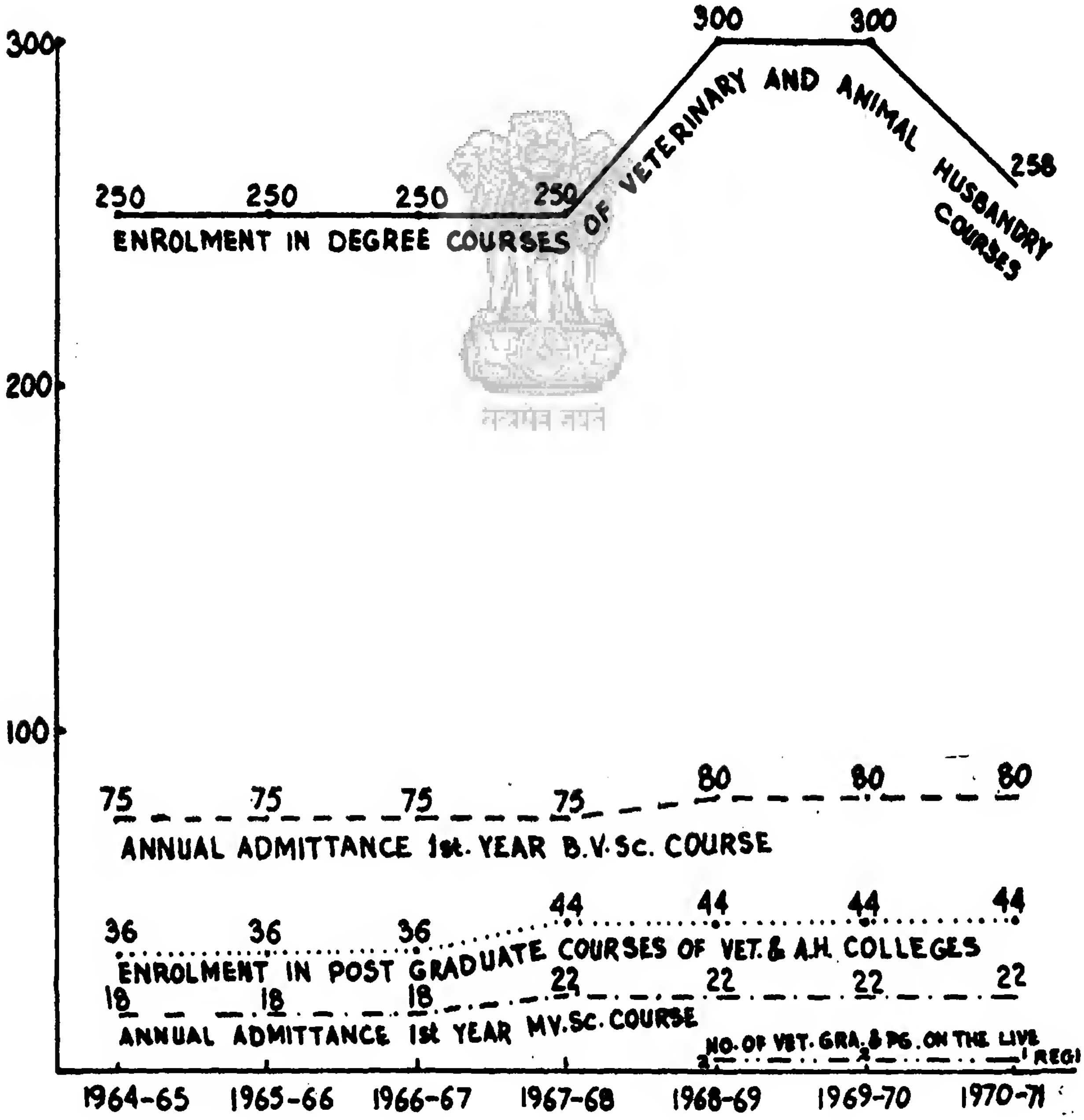


FIG. 9 (PARAGRAPH 53.5.4)

MADHYA PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF AGRICULTURAL UNIVERSITIES OF MADHYA PRADESH AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES.

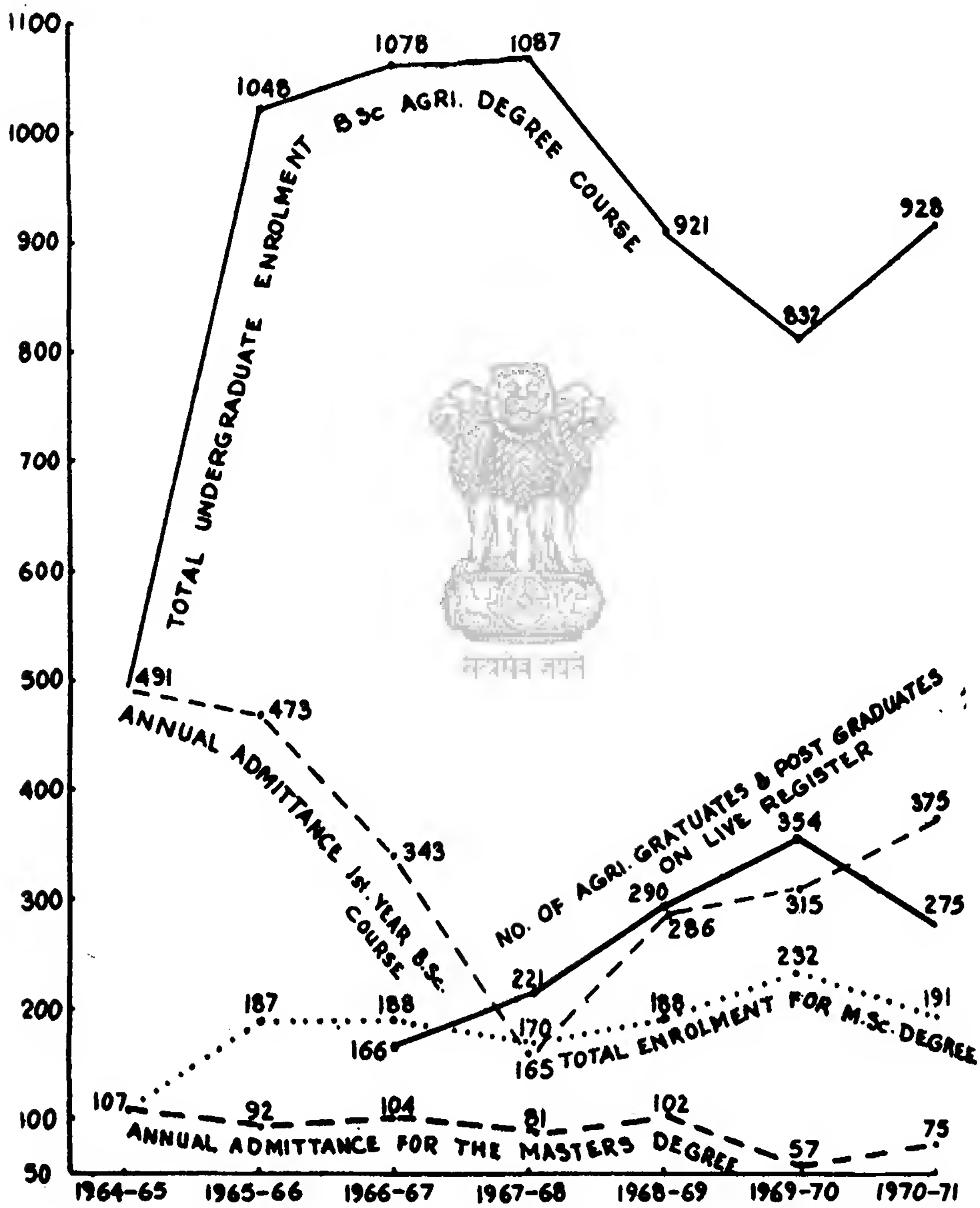


FIG. 10 (PARAGRAPH 53.5.4)

MADHYA PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN VETERINARY MEDICINE AND ANIMAL SCIENCE COLLEGES OF JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA, JABALPUR M.P. AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES.

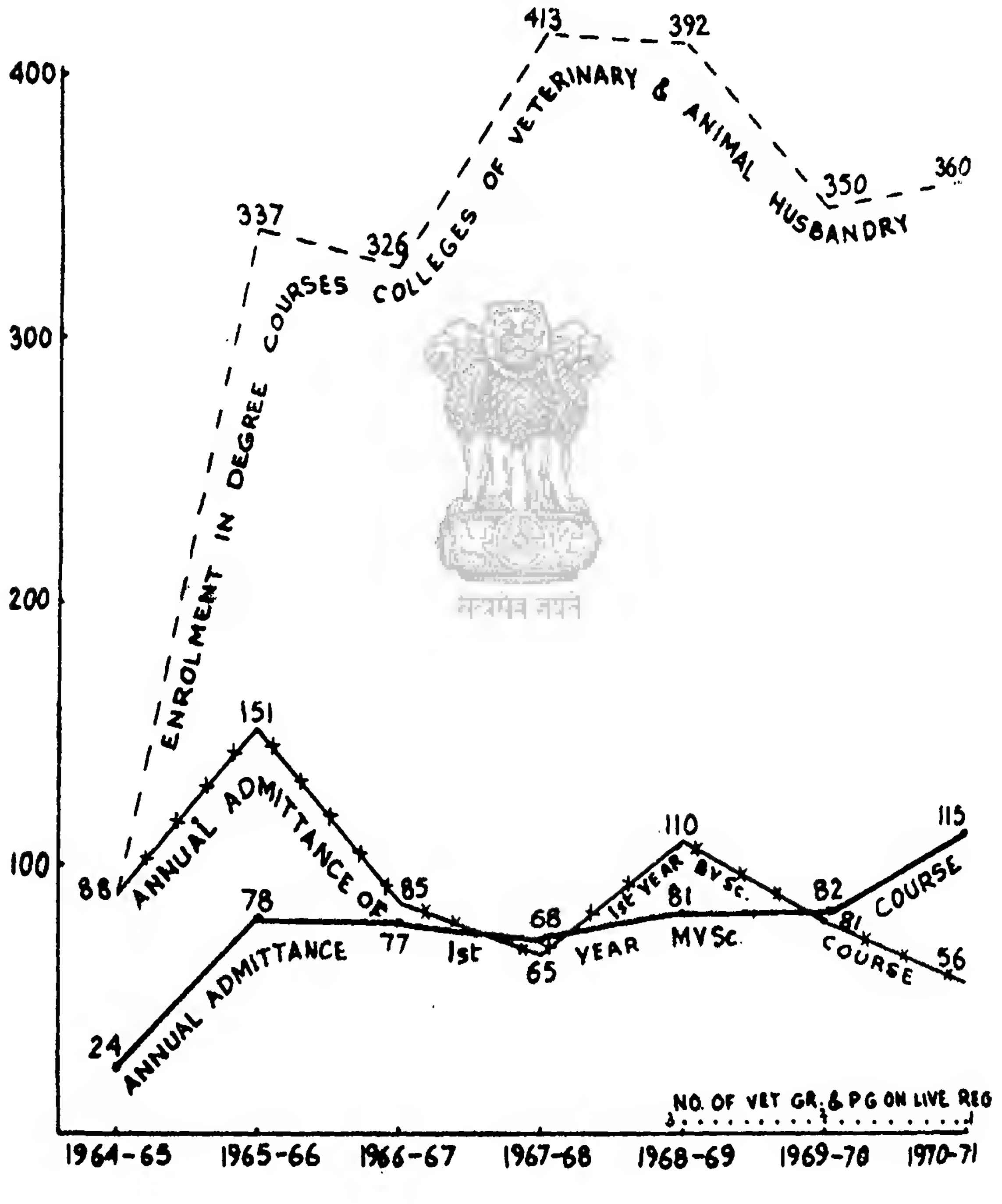


FIG. 11 (PARAGRAPH 53.5.4)

MYSORE (KARNATAKA)

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF UNIVERSITY OF AGRICULTURAL SCIENCE, HEBBAL AND UNEMPLOYMENT POSITION OF GRADUATES AND POST-GRADUATES OF AGRICULTURE IN KARNATAKA STATE

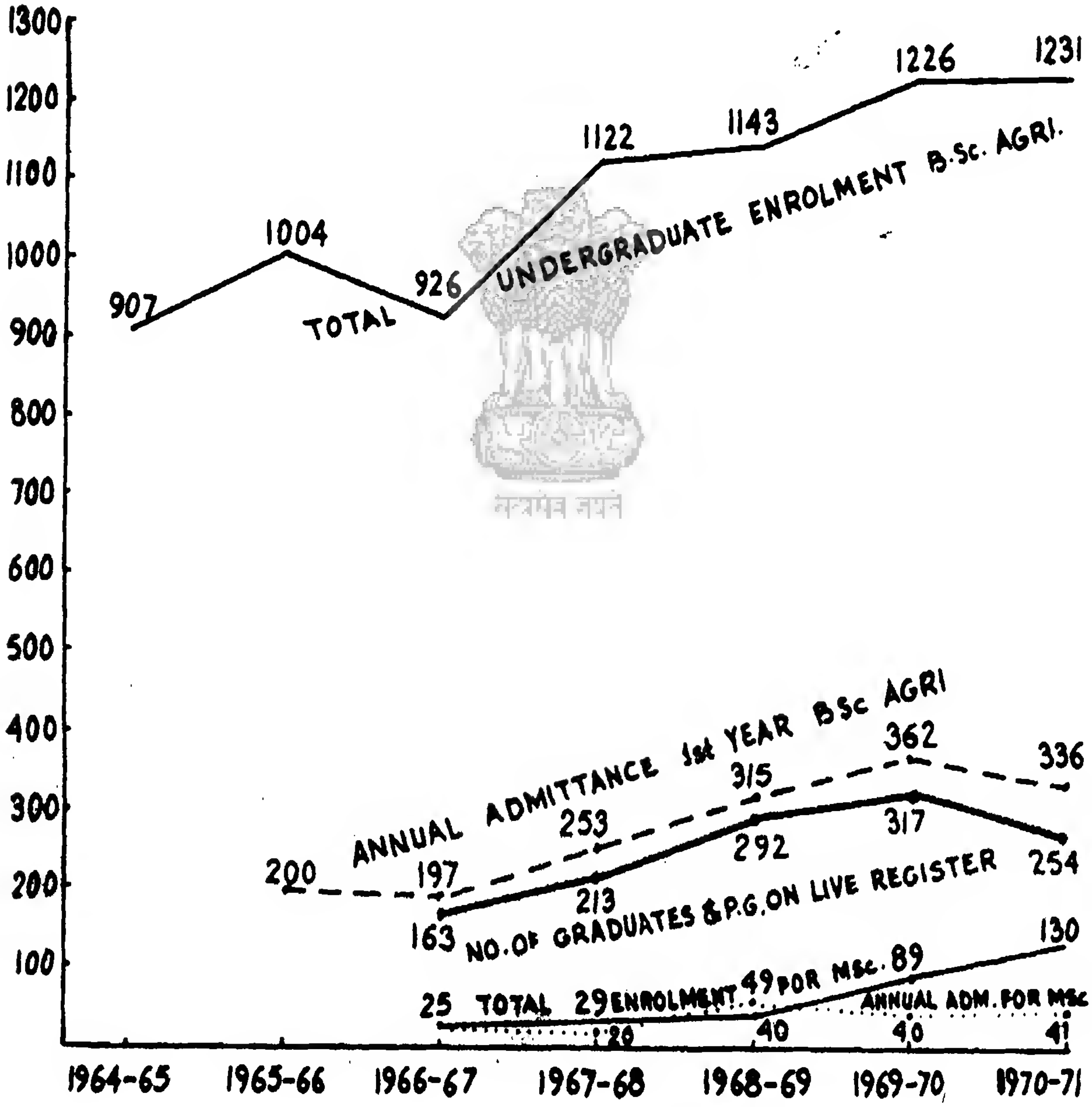


FIG. 12 (PARAGRAPH 53.5.4)

MYSORE (KARNATAKA)

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN VETERINARY MEDICINE AND ANIMAL SCIENCE COLLEGES OF UNIVERSITY OF AGRICULTURAL SCIENCE AND TECHNOLOGY HEBBAL KARNATAKA STATE AND UNEMPLOYMENT POSITION

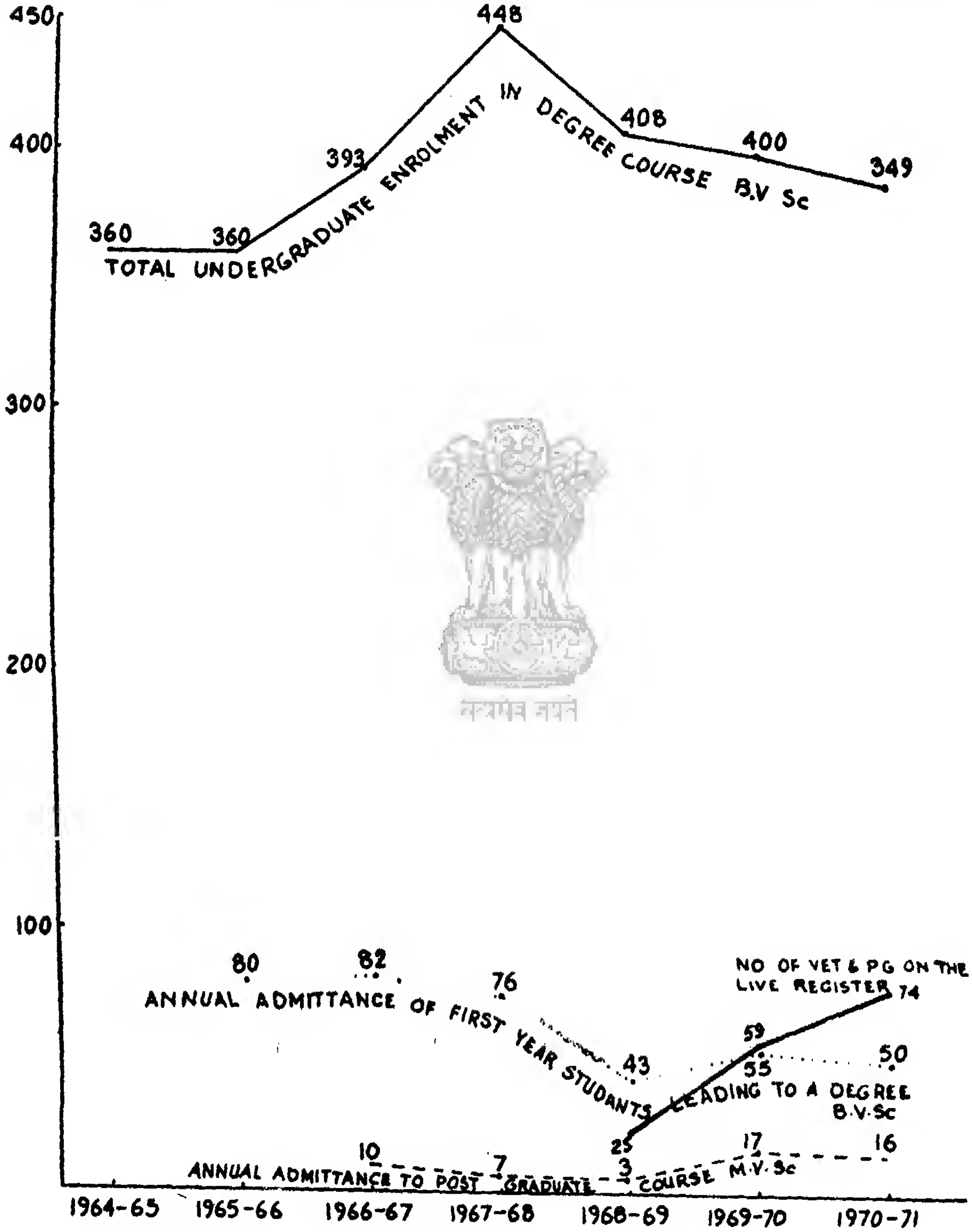


FIG. 13 (PARAGRAPH 53.5.4)

ORISSA

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF ORISSA UNIVERSITY OF AGRICULTURE & TECHNOLOGY AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES OF AGRICULTURE

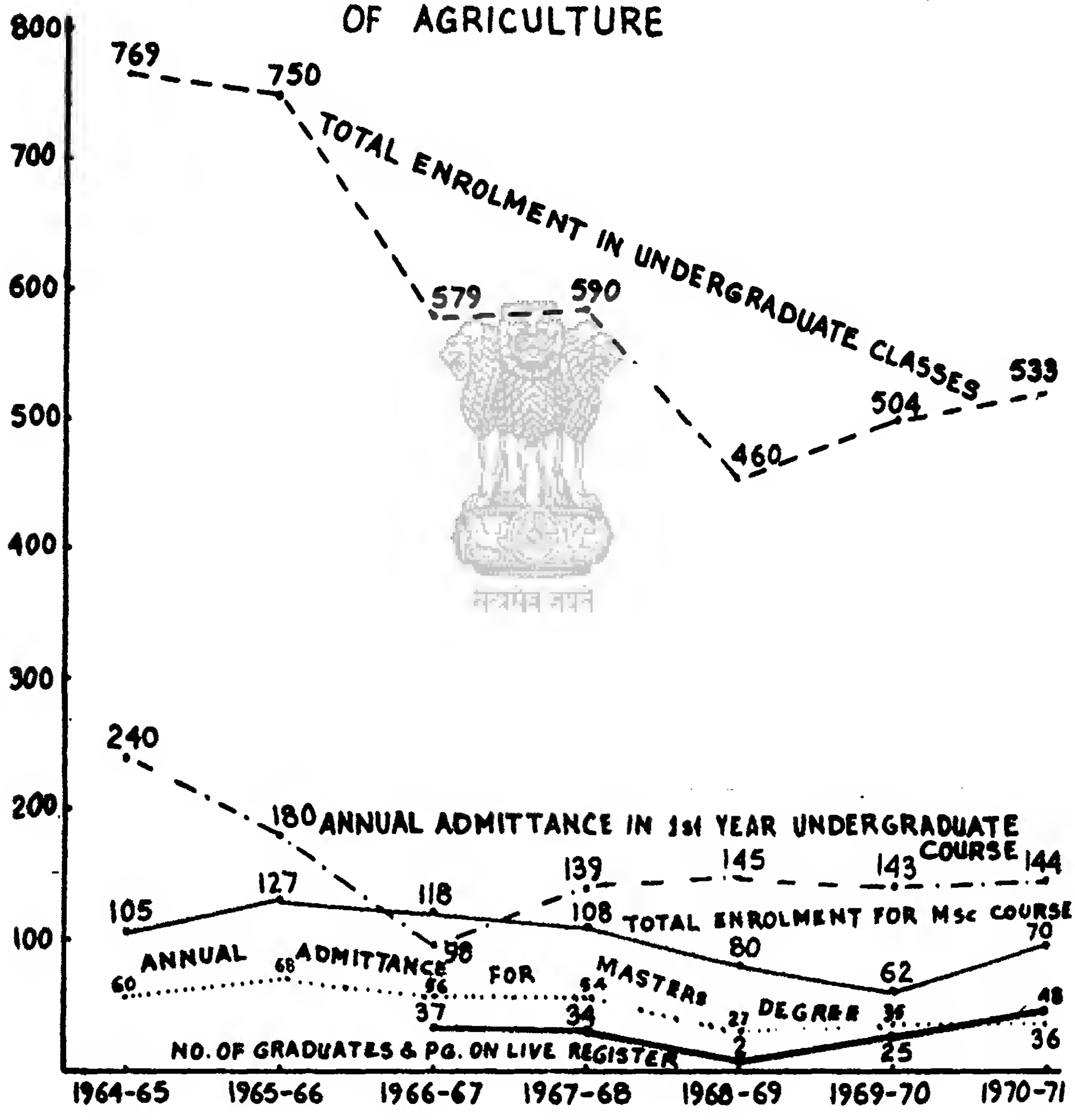


FIG. 14 (PARAGRAPH 53.5.4)

ORISSA

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN VETERINARY MEDICINE AND ANIMAL SCIENCE COLLEGES OF THE UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, BHUVANESHWAR, ORISSA AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES

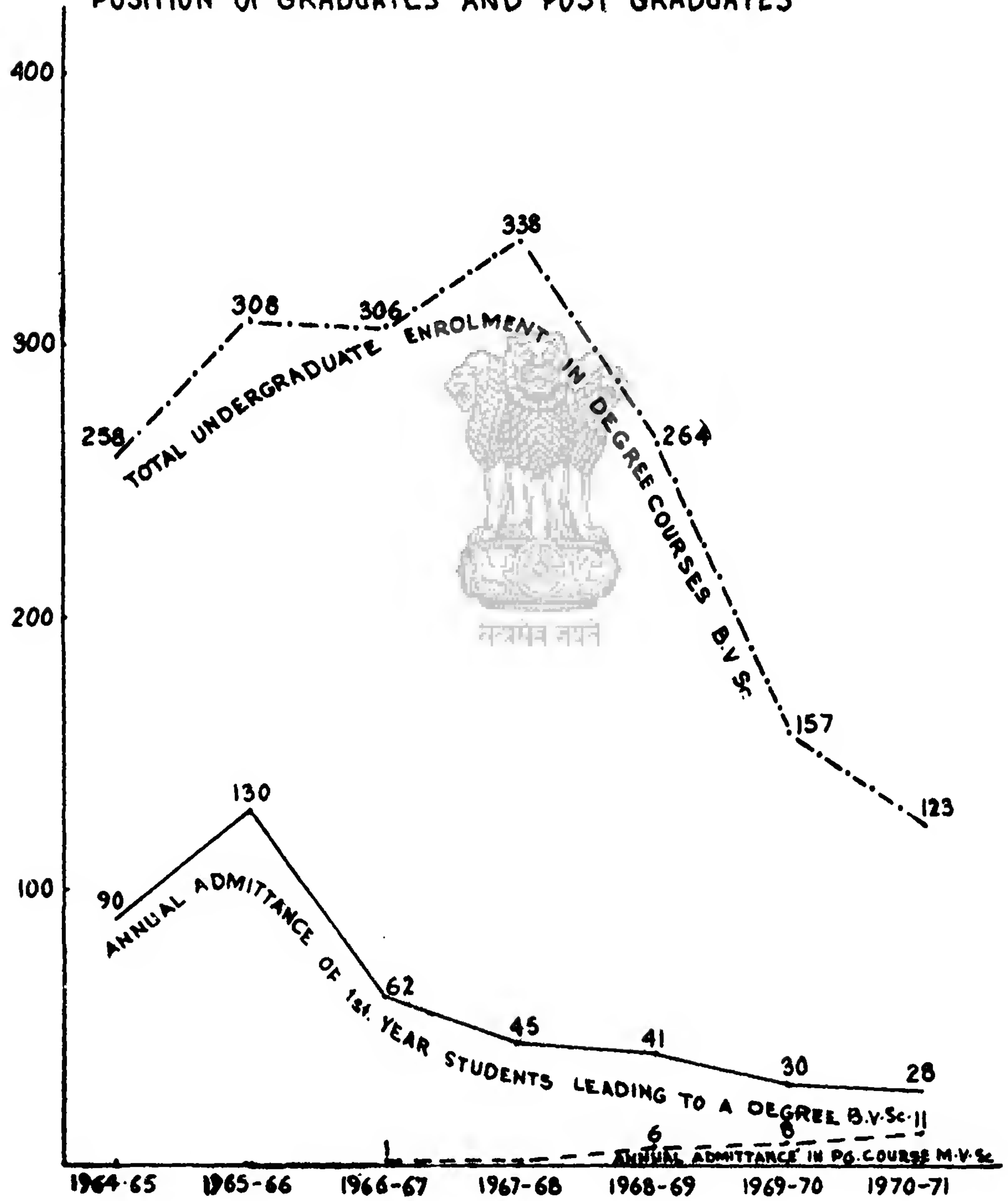


FIG. 15 (PARAGRAPH 53.5.4)

PUNJAB

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF PUNJAB AGRICULTURAL UNIVERSITY LUDHIANA AND UNEMPLOYMENT POSITION OF GRADUATES & POST GRADUATES

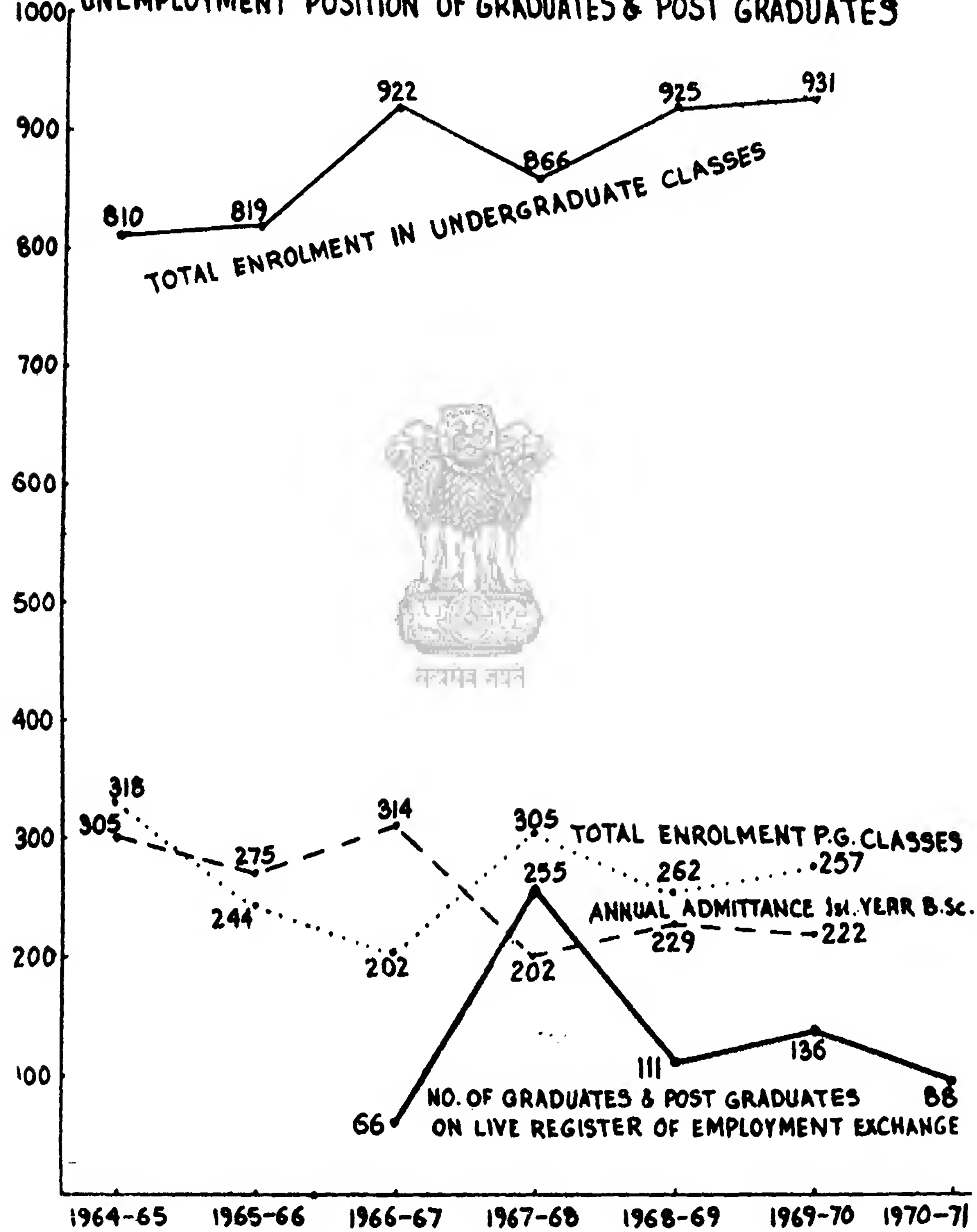


FIG. 16

(PARAGRAPH 53 5.4)

RAJASTHAN

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGES OF UDAIPUR UNIVERSITY AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES OF AGRICULTURAL IN RAJASTHAN

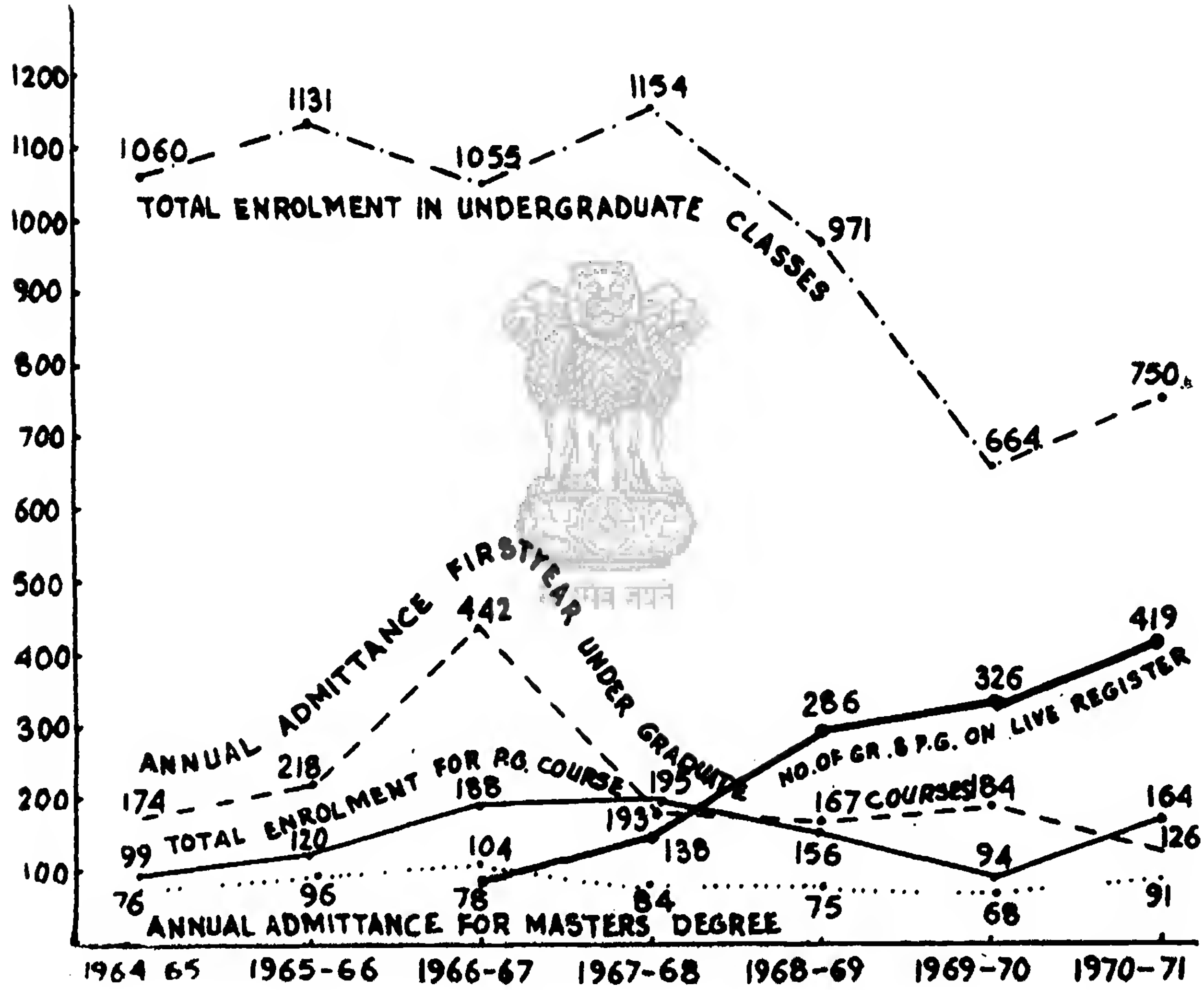


FIG. 17 (PARAGRAPH 58.5.4)

RAJASTHAN (UDAIPUR)

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN VETERINARY MEDICINE AND ANIMAL SCIENCE COLLEGES OF AGRICULTURAL UNIVERSITY OF UDAIPUR AND UNEMPLOYMENT POSITION OF GRADUATES & P.G

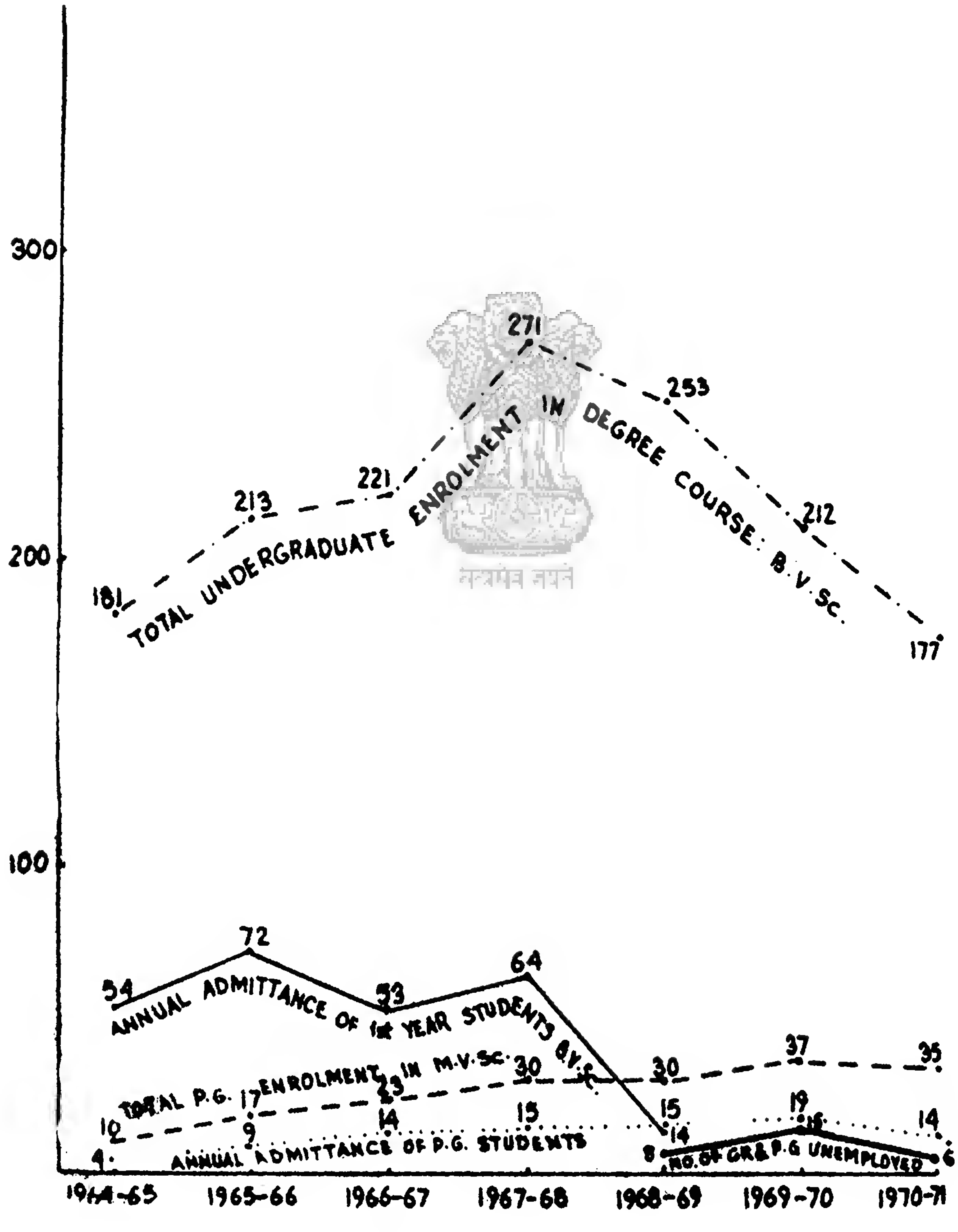
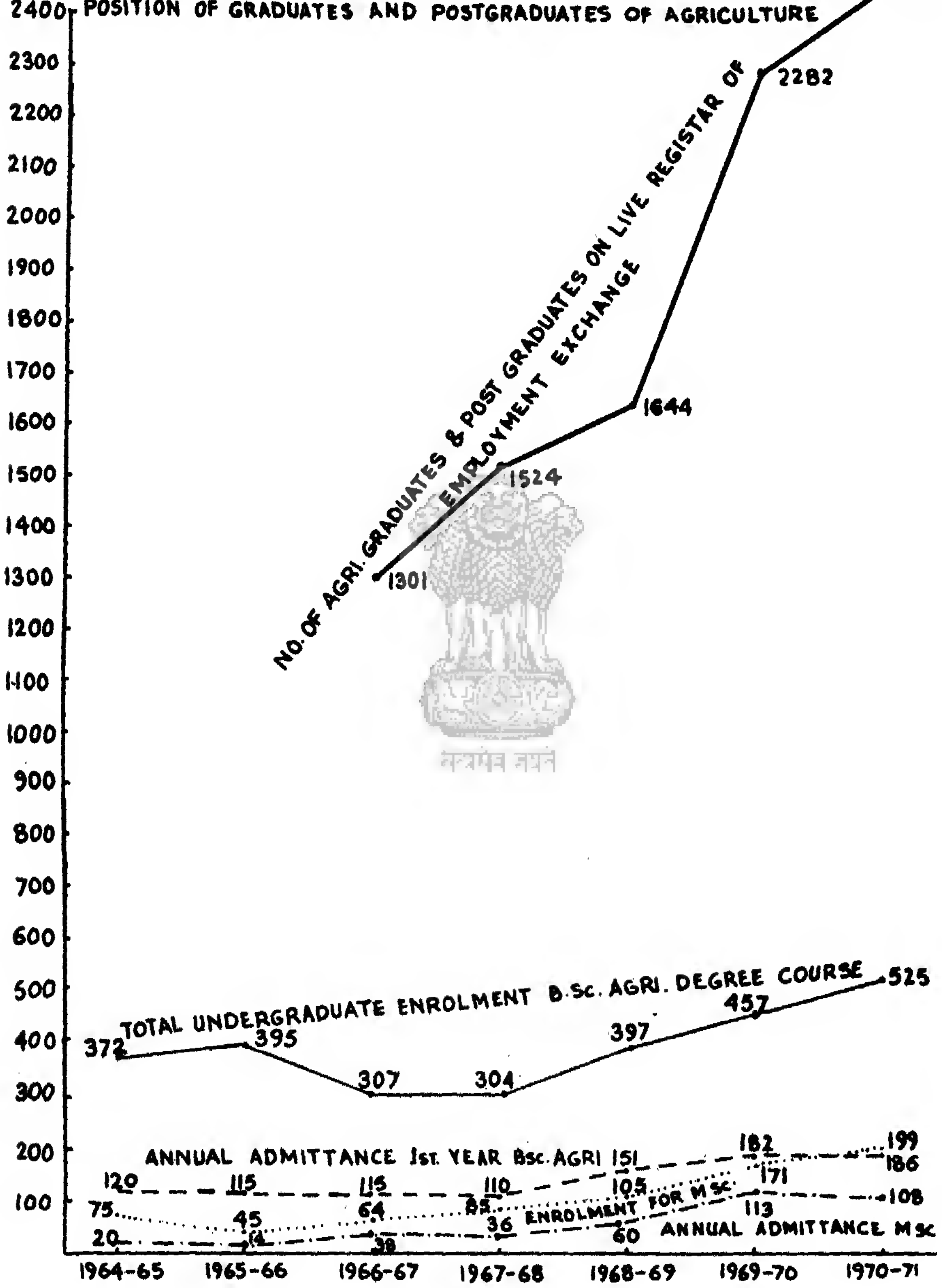


FIG. 18 (PARAGRAPH 53.5.4)

UTTAR PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st YEAR) IN AGRICULTURAL COLLEGE OF G.B PANT AGRICULTURAL UNIVERSITY PANTNAGAR U.P. AND UNEMPLOYMENT POSITION OF GRADUATES AND POSTGRADUATES OF AGRICULTURE



UTTAR PRADESH

TOTAL ENROLMENT, ANNUAL ADMITTANCE (1st. YEAR) IN VETERINARY MEDICINE AND ANIMAL SCIENCE COLLEGES OF THE G.B.PANT UNIVERSITY OF AGRICULTURE AND TECHNOLOGY PANTNAGAR U.P AND UNEMPLOYMENT POSITION OF GRADUATES AND POST GRADUATES

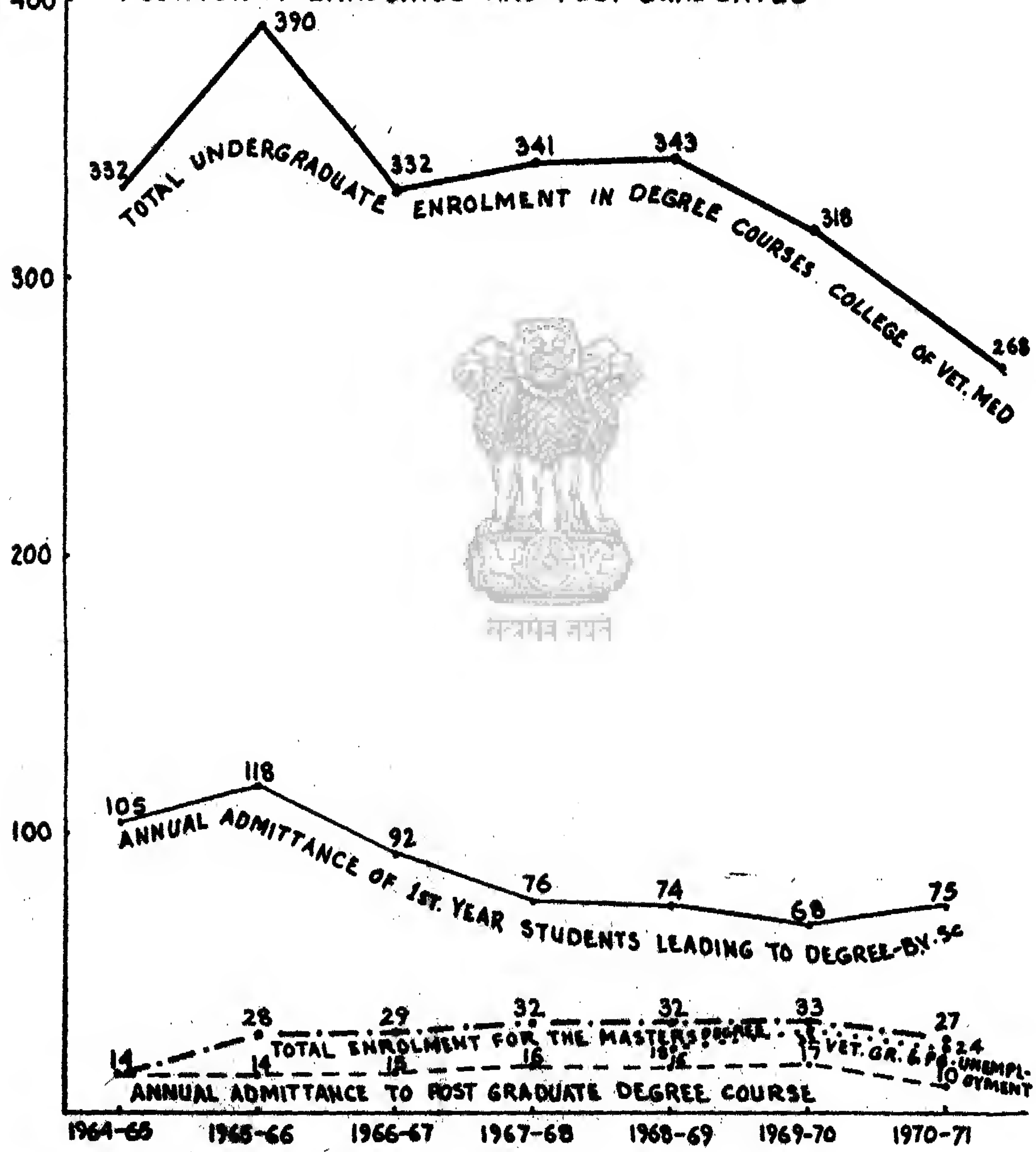
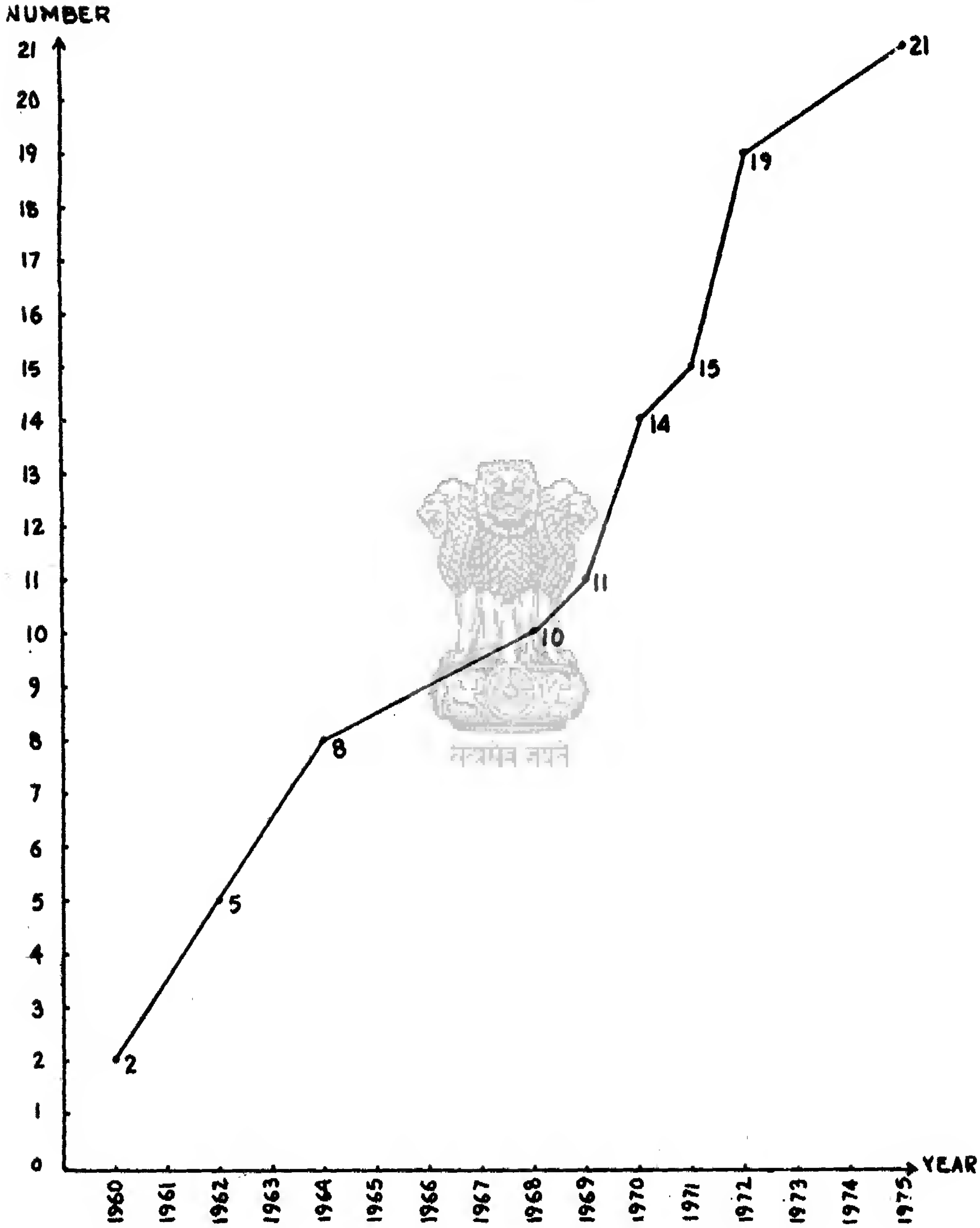


FIG. 20 (PARAGRAPH 53.5.13)

GROWTH OF AGRICULTURAL UNIVERSITIES



54

E X T E N S I O N

54

EXTENSION

1 INTRODUCTION

54.1.1 Extension and extension education relate to the process of conveying the technology of scientific agriculture to the farmer in order to enable him to utilise the knowledge for better agriculture and a better economy. This consists of provision for non-formal educational facilities through organised extension services, introduction of agricultural education in schools and education through non-degree institutional programmes to impart vocational skills to the farmers for improving their productive activities. As the farmers' capacity to use the knowledge is limited by the availability of inputs and services and other facilities, the term 'extension' is also being used loosely to cover the supply and regulatory functions. The National Extension Service (NES) which is the base for our extension work deals comprehensively with both these aspects and hence the possibility of confusion as to what is meant by extension. The existing educational and training approach and the methods adopted to achieve this goal are discussed in the following pages.

54.1.2 The term extension, as it is understood and widely accepted and as it is used in this Chapter refers to an informal out-of-school education and services for the members of the farm family and others directly or indirectly

engaged in farm production, to enable them to adopt improved practices in crop, livestock and fisheries production, management, conservation and marketing. Agricultural extension is not only imparting knowledge and securing adoption of a particular improved practice but also aims at changing the outlook of the farmer to the point where he will be receptive to, and on his own initiative, continuously seek means of improving his farm occupation, home and family life in totality.

2 SCOPE AND OBJECTIVES

54.2.1 Agricultural extension aims at improving the efficiency of the human capital in an effort to rapidly increase the rate of agricultural production. The agricultural extension programme seeks to impart the necessary skills to the farmers for undertaking improved agricultural operations, to make available to them timely information on improved practices, in an easily understandable form, suited to their level of literacy and awareness and to create in them a favourable attitude for innovation and change. As agricultural technology is continuously advancing, the training and education of the farmers has to be a sustained process so that the farmers are able to keep pace with the rapidly changing agricultural techniques.

54.2.2 Besides imparting knowledge and skills, extension has another important objective of changing the attitude and outlook of the farming community. In India, farms are mostly small and labour-intensive, with little direct linkage with advancing agricultural technology and industry. Hence the need for a massive education and extension effort to modernise the outlook of the common farmer, make him innovative, enterprising and willing to adapt readily to changing situations and new technology.

54.2.3 In the rural community, women contribute a substantial part of the labour in subsidiary occupations and quite an amount of key labour in agricultural operations. Women control the diet of the family. Therefore, when we talk of farmers' education, we should not forget that

educating the women in the farmers' households in agricultural innovations, subsidiary occupations and nutritional aspects of diet should be an important part of the programme of farmers' education.

54.2.4 The objective of the State Departments of Agriculture, Animal Husbandry, Fisheries etc. from the inception has been to educate the farmer and motivate him to increase production. Till the end of the Second World War, the organisation and the approach of these departments could only touch the fringe of the problem. The first major effort to spread the work on an area basis was started with the Grow More Food (GMF) Programme. This was a programme in development of crop production. Field demonstrations and contact with the farmers to introduce the improved techniques and initiation of a dialogue with the villagers were the main lines of approach. Field staff was strengthened for this purpose. The next important stage was the introduction of the National Extension Service with its complex of Village Level Workers (VLW) and subject matter Extension Officers in each block under the Community Development Programmes (CDP). The technical support to this group was from the existing State Departments of Agriculture, Animal Husbandry, etc. and the programme was mainly improved management of traditional agriculture and mass programme of improvement of cattle by eliminating scrub bulls and introducing quality ones. Greater use was made of audio-visual aids like magic lanterns and cinematograph, but the programmes were mainly of the same nature as those introduced in the intensive

cultivation programme viz. demonstrations, persuasion and a continuous dialogue with the farming community. The work was organised more systematically by the introduction of Panchayati Raj and bringing in the help of the elected representatives to support the dialogue with the farmers. Agriculture still being traditional, mass programmes were organised with simple techniques and marginally improved practices. The Intensive Agricultural District Programme (IADP) was the next experiment. The extension organisation was supported by a technical group of experts including farm management specialists at the district level controlled by a project leader to bring in coordination. The technical groups were more in the nature of trouble-shooters than extension specialists. The project leader was more involved in the other part of extension as generally understood viz. supplies, services and facilities.

54.2.5 With the introduction of the new strategy of increasing crop production and intensive development programmes in animal husbandry, a new dimension was added to the responsibilities of the extension organisation. New and continuously changing knowledge at the scientific level and modern techniques to support the utilisation of the knowledge had to be rapidly translated to the farmers effectively. In the year 1958 the Nalagarh[1] Committee

had recommended the formation of a technical group in every district to support the District Agricultural Officer in programmes of crop production. This Committee's recommendations which were, to some extent, translated

1 1958, Agricultural Administration Committee, New Delhi Ministry of Food & Agriculture, Government of India.

into action under the IADP, have yet to pervade the country. Animal husbandry even today has not got adequate technical support at the district level except in areas covered by intensive livestock development programmes such as the Intensive Cattle Development Projects (ICDP). In fisheries, the problem has yet to be faced even at the State level in some States. As the experience of the IADP shows, although technical groups were added, their direct involvement in the field programmes was limited.

54.2.6 The scientists were working in isolation and they had no direct knowledge of the problems that the farmers had to face in translating their recommendations into the farm programmes. In order to establish a direct link between the scientists and the field, in 1965 a programme of National Demonstrations was introduced. These scientific groups from the universities and also the technical groups in the districts demonstrated the technique and the knowledge on a farmer's plot in the village. By organising group discussions on the days of the demonstrations, a dialogue between the scientists and the farmers was established. As a support to this programme, from out of the dialogues on demonstration days and arising out of the problems that were faced in the demonstrations, broadcasts were developed for each of the districts to put across the lessons to the farmers in general who might be cultivating the crops that the demonstrations were trying to improve.

54.2.7 Though the extension organisation is substantially what it was under the NES, in some States the technical supports that are now being given to this organisation makes it more effective in communicating scientific agriculture to the field. Even then, a closer tie-up has to be established.

54.2.8 In the Community Development Programme, audio-visual aids like magic lantern and cinematographs were used by the extension workers to directly demonstrate certain programmes of improvement. The radio broadcasting system has been used for a number of years now to put across to the farmers information useful to them. Regular farmers' forums are now the order of the day in many of the broadcasting centres. The National Demonstration Programme was also utilised to specifically broadcast the information which can be immediately utilised by the farmer in his operations. In recent years, a television programme based on agriculture has been put across to educate the farmer. It is noticed that the extension organisation which was based on the NES and used the medium of man to man transfer through demonstration and dialogue, has now tried to use the more sophisticated mass media. The spread of information by either the radio broadcasting system or a television system can be much more rapid and widespread than what can be achieved through dialogue or through man to man transfer by an extension officer. Most of the work done so far has been to strengthen the man to man transfer organisation utilising demonstrations and dialogues.

Even the use of magic lantern and cinematograph was a part of the man to man transfer and was not in any way like either the broadcasting system or the television system. The improvement of the system of man to man transfer which has been worked in some detail during the last two decades is dealt with later in this chapter. The possibility of the use of the powerful mass media of radio broadcasting and television has also been examined. But for lack of any effective monitoring system and evaluation so far, an attempt has been made only to lay down the broad techniques of evaluation and motivation .

54.2.9 Women's education was started in the field with the employment of Gram Sevikas under the leadership of a Women Social Education Organiser in the Community Development Programme in 1952-53. This programme aimed at improvement of the home, health matters and later, family planning information. Meanwhile, in the Applied Nutrition Programme (ANP) formulated with the help of the United Nations International Childrens Emergency Fund (UNICEF) in 1963, Mahila Samitis were formed in the larger villages of the rural areas to deal specifically with the problem of nutrition of the children and the pregnant women and post-natal nutrition. These Mahila Samitis were also production-oriented to produce in the village itself necessary ingredients for a nutrition programme. Linked up with the ANP, intensive institutional training of about a month was provided to leaders of the Mahila Samitis. This training was also substantially nutrition-oriented and health-oriented.

There has, so far, been no particular programme to involve the village women in other types of training which will enable them to take larger part in agricultural production and subsidiary occupation. This gap needs filling up.

54.2.10 The problems of organising an effective extension service have been examined first with reference to the various tools of extension function, namely, demonstrations and farm information and communication supports, followed by discussion of the various ways through which the education of the farmers in the improved agricultural technology could be promoted, trainers' training and the role of various agencies at different levels in extension and farmers' education.

3 DEMONSTRATION

Impact of Modern Technology

54.3.1 Demonstration has been recognised over the years as one of the important extension methods and occupies a very important position in the country's extension programme. As an educational tool, it is used to demonstrate the tested procedures and techniques, their applicability to local conditions and superiority over local practices and techniques, and to help the farmer to learn by seeing and hearing as well as learning by doing and experiencing things for oneself. Demonstration work consists of three well defined stages which are (a) trial demonstrations or adaptive trials, (b) early or front-line demonstrations and (c) late or regular demonstrations. The trial demonstrations or adaptive trials are required to determine whether the new practices give the same results under local conditions as obtained in the experimental stations or elsewhere. Based on these results, new practices have to be recommended for a particular agro-climatic area. Early or front-line demonstrations are needed primarily to give confidence to extension workers about the suitability of the new practices. Regular or late demonstrations have to be well distributed over the area where the new practice has to be popularised since most farmers develop interest and confidence after seeing the experience of friends and neighbours on whose farms these regular demonstrations are established.

54.3.2 In India, the importance of result demonstration was recognised as early as 1928 when the Royal Commission on Agriculture (RCA) stated that "in order that agricultural researches

may be of use to the cultivator, their results must be given to him in a form in which they may become a part of his ordinary practices. In a country in which illiteracy is so widespread as it is in India, ocular demonstration is the best method of convincing the cultivating classes of the advantages of agricultural improvements".[1] In the earlier stages, the demonstrations were conducted on the Government demonstration farms by the Department of Agriculture. Since the introduction of the C.D. Programme in 1952, they were conducted on farmers' fields by the junior extension officers and VLWs. The purpose of these demonstrations was to change the villager's traditional ways of doing and thinking in order that his experience with the new methods could be so satisfying that it could result in his taking to the new ways and discarding the traditional ones. It was mostly a sociological approach. Research institutions and scientists were not directly involved in the extension activities or in demonstration work. The extension programme was confined mainly to communicating the information and not going far enough to demonstrate the value of such information.

54.3.3 Demonstrations have been a part of the extension programme from the beginning. Two-plot demonstrations showing one particular aspect of improvement compared with the farmers' traditional method have been done on a large scale. Three-plot demonstrations, with a control,

---

1. 1928 Royal Commission on Agriculture in India, page 15, "Demonstration and Propaganda".

farmers' best method and the scientists' best method, have also been laid down. Pest control had not been introduced for a long time in the demonstrations and, as a result, much of the effect of the demonstrations was lost, when pests were serious. Gradually it became apparent that unless a very good cultivator sees new science worked as a package resulting in a sizeable increase in his earnings, response to demonstrations is marginal. In the earlier years due care was taken to test the new practices through district trials in different agro-climatic areas before recommending them. Similarly, some work was done to have a few early demonstrations particularly on what then , were called as taluka demonstration farms which enabled the extension workers to develop sufficient confidence. However, in recent years when new technology is being imported from other countries, these well-defined stages of demonstrations have not been followed particularly test demonstrations or adaptive trials and as a result, large scale introduction of new agricultural practices has been taken up without establishing a firm technological base for those innovations. Therefore, a system had to be developed for maximising return with the new technology and impress the farmer. This needed a package approach by the best scientists. The National Demonstration Programme has been taken up to fill this gap. However, much more needs to be done in this direction.

54.3.4 The need for demonstrating the efficacy of new practices based on scientific knowledge, information and skill and bringing the scientist himself directly in contact

with field problems and channelising the results of research quickly to the farmers has been felt for some time. The research scientists should themselves be able to demonstrate the high quality of techniques evolved by them on bigger plots of cultivators' fields and test for themselves the validity of their recommendations. The necessity of this type of demonstrations became very imperative, as high yielding varieties were being introduced. They require entirely new techniques in agronomy and packages of practices to which the farmers were not exposed in the past. At the same time, it is difficult for an extension worker to keep himself abreast of the latest findings of research in all the branches of science he has to deal with in his day to day activity. Trained specialists have to be provided, who keep themselves in touch with their respective research institutions on the one end, and extend the latest scientific developments which have scope for adoption in particular areas in meaningful terms, to the extension workers on the other. They should maintain liaison between research and extension agency and act as feeders both ways.

National Demonstrations

54.3.5 To meet this important need, the National Demonstration Programme was launched in April, 1965. The main features of the national demonstrations are:

i) There is a specific minimum yield target and there is no separate control plot near the demonstration. The idea behind this principle is that the entire living memory of the farmers concerning the yield potential of the crop as well as the entire block in which the demonstration has been laid should serve as the control.

ii) The objective of the national demonstration is to introduce the concept of the productivity per unit area per unit time, in which the unit of area is kept at one acre/hectare and the unit of time a year.

iii) The concept of multiple cropping with 9/11 tonnes per hectare minimum grain yield in two or three crops respectively was fixed. Thus the multiple cropping which is a nature's gift to tropical areas has been made the key-note of national demonstration.

iv) These demonstrations are not in any way intended to supplant the existing departmental demonstrations meant for creating awareness for a particular improved practice(s) laid out by the extension workers. The uniqueness lies in the fact that the national demonstrations are laid out by research workers who will get an opportunity to demonstrate in farmers' fields what science can do to transform Indian agriculture.

v) The lay out of these demonstrations is the responsibility of the four subject matter specialists who are experts in the disciplines of agronomy, soil science, plant protection and agricultural engineering.

vi) The farmers in whose plots the demonstration is laid are to be actual cultivators with small holdings, so that the high yields obtained are not attributed to the effects of affluence. Scientists of research stations/agricultural universities have to demonstrate convincingly to farmers that the results which are obtained at research stations could be repeated on the farmers' fieldsas well.

vii) In place of generalised 'package of practices' the approach in these demonstrations is that the operations in various stages of crop production are to be determined by specific 'site factors' such as, slope, depth, texture, drainage characteristics, presence or absence of soluble salts etc. Thus every demonstration is a unique entity which shows the practices to be followed and yields to be expected at a specific site.

viii) Very intensive cropping system, techniques of soil and water management, including use of machinery and plant protection, are demonstrated. Thus, these demonstrations serve as 'pace setters' which are to be the first line of demonstrations and are to be emulated by local extension workers and farmers.

ix) These demonstrations are to serve as 'class rooms' where farmers are taught the appropriate techniques to be followed in crop management.

x) Even new problems requiring solution will emerge from these demonstrations. They will be fed to research organisations for their solution.

xi) These demonstrations provide an active bridge between research, farmers training and the food production programme of the country. Hence these demonstrations are termed as national demonstrations.

54.3.6 The National Demonstration Programme, no doubt, served a useful purpose of demonstrating the potential of new varieties on farmers' fields. This programme involved the demonstration of technology for high yielding varieties programme. It was therefore decided that scientists responsible for the improved technology should themselves demonstrate it on the farmers' fields so that its benefits could be carried effectively to the farming community at large. Accordingly in order to conduct the programme under the guidance of scientific experts it was transferred to ICAR in 1967 and a National Committee of Experts was constituted to lay down the policies and broad guide-lines for the National Demonstration Project. This programme emphasises application of the results of significant research and improvement in agricultural practices on the farmers' fields under the supervision of research scientists themselves to enable the farming community to see and learn about improved seeds and new methods and practices, and to have an opportunity to clear their doubts, on the spot. At the same time, the scientists could identify local problems, if any, through

the process of demonstration. The problems, local as well as universal, so identified, could be taken back to research institutions for further investigations. Thus national demonstrations besides their extension value are also meant to keep live contact between the research institutions, the problems at the farm level, farmers' training and extension agency. The National Demonstration Programme also underwent a new orientation with the emphasis on the concept of maximum production per unit area per unit time rather than merely on productivity per crop. The key note of the demonstrations has been multiple cropping and optimisation of economic yields per unit of time, water, land and energy.

54.3.7 Most of the State Departments of Agriculture, agricultural universities and Central institutes were expected to take up National Demonstration Programme with the help of the scientists who are specialised in the field of agronomy, soil science, plant protection and water management. However, what has happened is that instead of experienced scientists taking up the national demonstration work, comparatively inexperienced and junior scientists were recruited as specialists in various fields and they are incharge of the demonstrations. As a result, the original objective of encouraging research scientists themselves to conduct demonstrations has not been fully achieved. The visits by the subject-matter specialists to the demonstration plots has also fallen into routine. Visits by specialists, which are the essential aspect of the national demonstrations should be more frequent so that the expert advice of the

specialists posted at the operational level is made readily available to the farmers when they are faced with any specific problems. Farmers, however, have been deprived of superior expertise because in actual practice, only junior scientists are deputed to participate in these demonstrations. This defeats the very purpose of bringing scientists of proven ability close to the farms, farmers and their problems. Therefore, the operational procedure of the National Demonstration Programme needs improvement. The staff located at each of the research stations of the agricultural universities should be encouraged to conduct the national demonstrations around research stations rather than establishing a separate team of national demonstration specialists in a few selected districts.

54.3.8 Apart from this basic handicap, the National Demonstration Programme suffered from a number of other lacunae. In the initial stages, the programme was confined to major food crops and their production. Sufficient attention was not given to pulses, fibre and oilseed crops. Other commercial crops were also not taken in rotation on any large scale. Further vegetable and forage crops did not find a place to the desired extent. Since the taking over of the programme by the ICAR, some efforts have been made to remove some of these shortcomings. There is need for taking up more of commercial crops in various rotations, on demonstration plots so as to meet the needs of different categories of farmers. Further, the location of demonstration plot is more important than the size of the plot itself. It goes without saying that the demonstration

plots should be within easy reach of the farmers who are expected to benefit by them. Further, most of the demonstration plots depend upon irrigation for their water supply. There is, therefore, a need to make available to the farmers the necessary water management technology through these demonstrations.

54.3.9 Lack of complete facilities for soil analysis is another problem. The extension workers failed to get the soil samples analysed which could enable them to make proper recommendations of fertiliser doses. Wherever facilities for mobile soil testing laboratories are available, these should be fully utilised for the work of national demonstrations. Refresher training programmes for subject matter specialists in soil analysis have been organised by Central Soil Salinity Research Institute (CSSRI) Karnal. There is however need for diversifying and extending such training facilities on a wider scale in the States. Agricultural universities in different States should therefore arrange intensive refresher training programmes for subject matter specialists in soil analysis so as to make them fully conversant with the latest research in techniques of soil testing. They should also be acquainted with the micro-nutrient deficiency symptoms in the crops.

54.3.10 Demonstrations will have practical value and influence only to the extent that people see, hear or read about the results. Even the most modern demonstrations by themselves will reach only a few people. Experience with India's extension work reveals that the results of demonstrations are not adequately used to serve these purposes. It is,

therefore, necessary to see that the results of demonstrations are used with greater effect through the use of other means and agencies such as news stories, meetings, leaflets, communications through radio and the press. For the illiterate farmers use of audio-visual aids is essential along with the demonstrations. In order to encourage farmers to come in large number to the demonstrations the block staff and the radio should be used for wide publicity. During such visits, literature appropriate to the demonstrations should be distributed among farmers.

54.3.11 The farmer whose plot has been selected for national demonstration is expected to undertake the agricultural operation himself on the selected plot under the guidance of the subject matter specialists and extension workers. In some States, field days are organised, during which the farmers explain the method adopted by them. These efforts are supplemented by the experts. Farmers' rallies and camps are organised in Andhra Pradesh and Maharashtra and training of farmers in Andhra Pradesh, Karnataka and Punjab. Field days, farmers' rallies, camps, training and publicity activities need to be organised on an accelerated scale for making these demonstrations fully serve the purpose for which they are designed.

54.3.12 National demonstrations so far have been laid out for multi-cropping in the irrigated and assured rainfall areas. Agricultural development involving crops is much wider than cultivation of irrigated area and assured rainfall area. Dry farming research, fodder research, horticulture research (including vegetables) and plantation research, have all

been intensified in order to enable the nation to plan the best use of land and capital. Scientific achievements in these fields have to be translated into production by the farmer in order to get the best of research results. We, therefore, recommend that suitable national demonstration programmes should be developed for each of these sectors which should be the

responsibility of the research organisations and the technical experts under the State administration.

54.3.13 Intensive livestock and poultry development for increasing the productivity of different species e.g. milk yield in cows and buffaloes, wool and mutton in sheep, eggs in poultry, meat in pigs etc. has been accepted as a policy with special emphasis to promote these subsidiary occupations through a large majority of small and marginal farmers and agricultural labourers. Such a programme will be supported through substantial investments in research and development for evolving and multiplying superior types of livestock including poultry most suited to local agro-climatic conditions. Apart from production of genetically superior seed stock, infrastructure for effective health cover and for augmentation of feeds and fodder for the improved stock are also being provided. All these efforts will be of no avail unless the farmers can be taught to put into practice the improved techniques and methods for bettering his economy. Hence farmers' training and demonstration in different aspects of animal husbandry will be an important pre-requisite for successful achievement of production and social objectives of

these programmes. With the progressive and increasing adoption of crossbreeding of local cattle with exotic dairy breeds, there would be need to educate and convince the farmers of the utility of crossbred bulls for draught. There should be suitable demonstration on farmers' holdings on the proper use of crossbred bullocks in different seasons. Suitable and properly designed National demonstrations should be held on other animal husbandry activities such as improved poultry raising, sheep rearing for wool and/or mutton, and swine husbandry also. Obviously, some of these animal husbandry activities cannot be land based but will be community based as only common breeding programme and cooperative marketing organisation would ensure successful results and profitable returns. For example, in poultry development, introduction of improved cocks (purebred and crossbred) to replace all the indigenous male breeding stock will have to be arranged on a whole village basis. Milk production enhancement and marketing programmes have to be organised on a village basis for reducing the cost on inputs and services and maximum return through elimination of middlemen. In these whole village/community demonstrations there is need for continuous and expert support from scientists and technical personnel attached to the administration at various levels.

54.3.14 Similarly, in fisheries, national demonstrations will have to be developed. It is only in certain States that private farmers have got inland water spreads of their own to develop pisciculture. A substantial area of inland water

and brackish water are controlled by the State or the State institutions. Demonstrations will, therefore, have to be developed mostly on such Government or institution-owned farms to act as the pace-setters for intensive development of other water spreads in the surrounding areas. The type of national demonstration to be supported by research personnel will have to be specially thought out to make the maximum impact. This will, to a large extent, also depend on the type of intensive production programmes that are organised in the Fifth Plan and later.

54.3.15 The need to utilise irrigation supplies most efficiently for greater production is now well recognised. In areas where there is paucity of water resources, it becomes a matter of great importance to reduce irrigation losses to the minimum. These losses take place not only in the distribution channels but also in the field itself. Also, irrigation has to be regulated to accord with moisture deficiency in the soil. Particularly, irrigation has to be ensured at the crucial stages in the plant growth, otherwise the yield is affected. All these matters require demonstration and should, therefore, be included in the National Demonstration Programmes.

54.3.16 More emphasis is needed to have systematic test demonstrations or adaptive trials on the farmers' fields in different areas recommended for trials. What is required is some arrangement by means of which at least a small number of progressive and intelligent farmers in each district or smaller area may participate actively in such trial demonstrations or adaptive trials. These will provide a

forum where they may regularly report findings of testing in a scientific manner. Such an analysis of results of field trials would naturally indicate the suitability or otherwise of new practices recommended for different areas. Some suggestions in this regard have already been made in our Interim Report on Some Aspects of Agricultural Research, Extension and Training.

54.3.17 The work and experience under the national demonstrations should be evaluated continuously so that lessons of universal application are disseminated and there is an adequate feedback to the agricultural universities and research stations for better organisation of these demonstrations.

Motivation of Farmers

54.3.18 It is desirable to have a large number of demonstrations possibly in hundreds per block to ensure sufficient positive results to change people's minds. It is only after such a widespread network of demonstrations that a practice begins to become general for the farmers to adopt it. The present procedure of conducting demonstrations by providing free inputs does not help adequately to reach this objective. Further when free supply of inputs is tagged on to the demonstration work, less emphasis is given to motivate farmers by educating them regarding the advantages of the new practices. As a result, the demonstration programmes are not taken very seriously in many blocks and are treated in a very routine way and thus the objectives of the programme have not been fulfilled in achieving the desired result of motivating

farmers through the educational process by using the demonstrations.

54.3.19 Transfer of agricultural technology requires voluntary participation of farmers in adopting new agricultural practices. There are two motivational approaches which may be used to create interest among farmers regarding new agricultural technology namely (a) intrinsic motivation and (b) extrinsic motivation. While intrinsic motivation is encouraging a person to do something based on the merits of the practice itself, the extrinsic motivation uses some artificially introduced incentives. Using subsidy for demonstration in order to encourage the transfer of agricultural technology belongs to the extrinsic type of motivation. One of the main obstacles in the way of motivating farmers has been the use of extrinsic motivation in the demonstration programmes. There are two major deficiencies in using this approach. First one is that it will not always enable the people to perceive the practical benefit of the new practices. Even a practice which may not be really beneficial to farmers can be promoted for some time with the help of subsidies. When such things happen, it will soon lead people to frustration and as a result, time, efforts and money spent on motivating people will not be rewarded. There is adequate emperical evidence to show that acceptance of promotional programmes based on free things has been negligible. The second deficiency is that the extrinsic motivation will limit the promotional work to the extent of budget available.

Use of intrinsic motivational approach on the other hand will avoid these drawbacks. Further it will ensure the conduct of educational activities in the community. It is, therefore, necessary that intrinsic motivational methods should be used more and more in extension work to motivate farmers.

54.3.20 The extension workers often meet farmers individually and try to interest them to adopt new practices. Research in the field of social psychology like experiments on radio forums has, however, indicated that discussion group method is always superior to individual contracts or straight talk method in motivating individuals for action. It is, therefore, necessary to encourage extension workers to organise village meetings and discuss the advantages of new practices in order to motivate the local community. Various microstudies have shown that among the various channels of imparting new technology to the farmer, this method has given the best results.

54.3.21 Quick transfer of agricultural technology is directly related to innovative behaviour among farmers which in turn is related to high achievement motivation. Educational work with people has supported their achievement motivation. It is, therefore, necessary to focus attention on increasing achievement motivation of farmers as one of the means to promote quick transfer of agricultural technology.

Coordination with Agri-Support Activities

54.3.22 It is generally observed that farmers especially small farmers are slow in adopting new farm practices particularly those involving additional cash inputs. This fact has also been validated by several researchers in our country. Many attribute this slow action on the part of farmers to their lack of interest or to inadequate extension participation. However, when special programmes like the village adoption programmes are launched by banks, farmers have not lagged behind. The same is observed in case of farmers covered by sugar factories where credit and inputs are provided by the factories. Hence the need for local availability of agri-support activities and the coordination of extension work with them. This has to be recognised as essential for the rapid transfer of agricultural technology.

4 FARM INFORMATION AND COMMUNICATION SUPPORT

The Existing Organisation

54.4.1 Farm information and communication support is accepted as an essential component of agricultural extension programme for supporting the productive activities of the farmer. Considering the importance of these activities a Central Information Unit was established as a part of the Directorate of Extension in 1958. This Unit is responsible for providing information and communication support to the different divisions under the Department of Agriculture and Rural Development, planning and producing information and communication material for the field extension workers, organisation of competitive shows in different fields, such as livestock, poultry, fruits etc., provision of audio-visual aids for educating the farmers and planning, production and distribution of instructional and research films. The Directorate of Extension is also responsible for training the agricultural information personnel at various levels and maintaining a close liaison with the All India Radio (AIR), universities, research institutions and concerned Ministries and departments for the purpose of better coordination and dissemination of agricultural information.

54.4.2 Farm information units with identical functions were established in all the States, and to provide intensive information support to the IADP, information units were also attached to the 15 'project districts.' District Agricultural

Information Officers have been appointed in the intensive agriculture areas, and nucleus staff is also being maintained for this purpose by the various commodity development directorates. The autonomous bodies and public undertakings such as Indian Council of Agricultural Research (ICAR), Fertiliser Corporation of India (FCI), National Seeds Corporation (NSC), All India research institutes viz. Indian Agricultural Research Institute (IARI), Indian Veterinary Research Institute (IVRI), National Dairy Research Institute (NDRI), Central Food Technological Research Institute (CFTRI) have also arrangements for dissemination of research information to a limited extent. Agricultural universities have also established extension wings and communication centres. Considerable work is also being done in this respect by the industries in the public sector.

54.4.3 The existing arrangements for farm information and communication are of several kinds. These include publicity posters giving specific information on field operations, visual demonstration of practices and instructions, supply of brochures and pamphlets on local problems in the local language, film and magic lantern shows, radio broadcasts, television shows and personal contact by the extension staff. Considerable amount of organisation and division of functions has to be brought about in this field.

54.4.4 Publicity posters dealing with specific field operations have obviously to be linked up closely with the district extension organisation. Any centralisation of the dissemination or the format will be self-defeating. It is necessary to ensure that the decisions on the form and time and method of dissemination are taken at the district level.

54.4.5 For field day support, the method of presentation and the charts and visual demonstrations that are necessary to put a message across have to be drawn up by the State organisation. In the actual presentation, modifications of the details to suit local conditions will have to be drawn up at the district level. The best example of this is the field day practical demonstration organised in Tamil Nadu.

54.4.6 Brochures and pamphlets have to be extremely topical and should not be treated as of permanent value. During the course of our tours we noticed that brochures and pamphlets issued by the information wing, where general instructions were sought to be given, were out of date with the research findings. The information organisation should have close rapport with the research scientists and the information should be regularly updated and the old material should be eliminated. A lot of streamlining has to be done at the State level and at the Central level in this matter. In particular, we noticed that material issued by research organisations sometimes gave wrong information. There is a need for all concerned to see that information broadcast in their names is really checked by the people responsible and is accurate. Also, the central information organisation should not try to disseminate too much of material in this form. As the material is effective only on extremely topical matters based on local factors, a central organisation trying to meet this demand is

obviously untenable. The central information unit should, if at all, disseminate important scientific findings to the administration in the States and leave it to them to disseminate what they think is topical and important in their locality. The State organisations also should be extremely selective in the items they put across to avoid confusion. Lastly, it has to be kept in mind that literacy being low in the rural areas. this form of dissemination has really got very limited spread effect. Therefore, keeping this in view and the possibility of confusion due to wrong information, the information unit should be extremely selective in using this medium.

Films

54.4.7 Films and magic lantern shows have again got to be topical. The central information organisation is responsible for planning, producing and distributing instructional and research films. States have also got film units which produce films. It is necessary to streamline the entire organisation so as to ensure that films made are really topical and of immediate interest and they are properly dubbed in the local language. As centralised film making does lead to a uniformity which is undesirable in the agricultural field, steps should be taken to prepare films which may have regional interest and are important for the region. Magic lantern shows have to be extremely localised and have to be prepared by the State organisation and, if necessary, improved upon by the district organisation.

Radio and Television

54.4.8 Radio broadcasts are used now to inform farmers about meteorological conditions, pest conditions and important instructions in the farming calendar. Topical discussions are also put across which form the base for charcha mandals (discussion groups) in the villages. Broadcasts to support the national demonstrations are also made.

54.4.9 Television has also been introduced around Delhi, and is being gradually extended to other centres as a medium of information. Transmitting television programmes through earth satellites to direct receiving sets in 2,400 villages in six States has been undertaken on experimental basis. Recently, a study has been made of the effectiveness of this operation in teaching the farmers. The report of the study has been published by the Indian Institute of Management, Ahmedabad. The report has brought out certain important aspects in the presentation of the programme and in the absorption of knowledge by the farmer. The points made out are:

i) Sixty per cent of the information put across is lost in transmission and this is not attributable to the individual characteristics of the target audience.

ii) An average farmer-viewer did not even know the exact meaning of about 58 per cent of the technical terms that were used in the selected programmes. Either the language has to be made simpler or the farmers have to be given some education about the meaning of terms.

iii) The target audience already knew 62 per cent of the sampled information televised on wheat, and 50 per cent of the sampled information televised on potato. This made the programme in the view of the farmers uninteresting.

It is, therefore, observed that violation of the maximum threshold of information redundancy may result in a programme being perceived as uninteresting by viewers.

iv) Fatigue was reported by a substantial number of farmers in each telecast audience. This may be yet another reason for information loss. This shows the need for timing the broadcast properly.

v) The farmers attend Krishi-Darshan and Delhi TV's other instructional offerings to fill free evening hours rather than with the intention of gaining information about practices that will boost their profits from agriculture.

vi) Twice as many farmers gained in the area of logic-knowledge as did in the area of how-to-do-it procedures knowledge. This seems to indicate that the medium may be more effective in transfer of logic-knowledge than procedures-knowledge.

The above observations based on one single study of a small population may not be representative. At the same time, the study does raise various problems of competence in preparation of programmes and the knowledge of mass psychology in getting them across. Some more studies on effectiveness of television in dissemination of information or technical know-how have also been conducted by various institutes such as Indian Agricultural Research Institute and the National Council of Educational Research and Training. Many more studies will have to be done in these media relating to mass psychology as a continuous process before these powerful media can be effectively used for education.

54.4.10 No comparable exercise has been done in the field of radio broadcasts. Now that a doubt has been raised whether the communication experts understand the medium of communication and the level of understanding of its audience, it will be necessary to carry out similar studies about the

efficacy of the radio broadcasting system and how it can be improved. We feel that this is an immediate problem needing attention.

54.4.11 A doubt may arise whether the audio-visual communication through films and magic lantern may suffer from the same defects. In this case, the practice appears to be that the films and the magic lantern shows are accompanied by a running commentary by field extension officers. This gives an opportunity for the farmers to ask questions and clear their doubts if they did not understand some part of the programme. This facility is not available in a radio broadcast or a television show.

54.4.12 Very little use is now being made of the local press in disseminating farm information. There are four important advantages of using newspapers as communication media for development namely ;-large and regular audience, low cost communication, retention value, and fast communication. It is, therefore, necessary that the State departments and the agricultural universities should try to use the newspapers more and more for disseminating farm information. This work requires some type of understanding between these agencies and the concerned newspapers.

5 FARMERS' EDUCATION AND TRAINING

Concept of Farmers' Training

54.5.1 The National Demonstration Programme to which a reference was made earlier, was quickly followed up by the farmers' education and training programme launched by the Directorate of Extension, Ministry of Agriculture and Irrigation in 1966-67. The objective of the training ptogramme is to educate the farmer in improving cultural practices according to his specific needs and help him in adopting the most economical methods for optimising production and utilising the potentialities to the maximum extent. The aim is also to train farm leaders in the villages who can, through their example, create an urge in their neighbours to emulate and improve.

Progress and Suggestions for Further Improvement - A Review

54.5.2 The Farmers' Education and Training Programme was initiated as a Centrally sponsored joint schemes of Ministries of Agriculture and Irrigation, Information and Broadcasting and Education & Social Welfare in five districts in 1966-67, 20 additional districts were taken up in 1967-68, 25 in 1968-69, 10 in 1969-70, 20 in 1970-71 and an equal number in 1971-72, bringing the total coverage to 100 districts out of the total number of 356 districts in the country. During the Fifth Five Year Plan period another 50 districts are proposed to be covered by this programme.

54.5.3 The Farmers' Training Programme is being carried out in collaboration with the Departments of Agriculture, Education and Community Development in the States and AIR,

ICAR and agricultural universities. Till March 1975, 1,82,831 farmers and 93,652 farm women have been trained in improved farming practices in 6,191 and 3,161 specialised short courses respectively. About a million farmers and farm women have been trained through 28,000 production-cum-demonstration training camps. Nearly, twenty-thousand farmers and farm women discussion groups are continuously disseminating upto-date information on cultural practices and innovations as well as providing solution to the problems faced in the field to about four hundred thousand farmers and farm women; 10,655 convenors have been trained in 716 specialised courses regarding organisation and management of discussion groups.

54.5.4 The Farmers' Training Programmes were launched in farmers training centres where regular classes were run, supported by farm work in the attached farm. For the farmer to get maximum return out of this education, he has to be reasonably literate. This substantially curtails the field of selection from the villages because rural literacy is still not widespread. Training of farm leaders who can become the extension medium in the villages does not appear to have really fructified. Various studies have been carried out on the channels through which the average farmer in the village gets his knowledge of new practices. These studies show that contrary to expectations, farm leaders in the rural areas do not necessarily pass on their knowledge to their neighbours. In fact, because of class and caste distinctions and because

the literate farmers are well-to-do-farmers belonging to higher castes, the required spread of the technique and knowledge is not achieved. These studies show that the VLW, provided he is able to explain the programme, is often the most important extension agency. We, however, feel that this should not lead to abandonment of the Farmers' Education and Training Programme. What is necessary is to see that after going back to their villages these farm leaders are involved in the extension process so that they actively help the extension organisation in disseminating knowledge and in providing demonstrations of higher technology. A suitable frame has to be developed to achieve this.

54.5.5 It has been observed that Gramsevak training centres and farmers' training centres are often located at the same campus. Such close proximity offers possibility of maximum utilisation of resources of both the centres, provided the programmes are coordinated. We, therefore, recommend that farmers' training centres and gramsevak training centres, as far as possible should be located at the same campus and a senior officer should be in-charge for coordinating the activities of the training centres and production programmes in the district.

54.5.6 The objectives of these training centres envisage providing training to farmers in various aspects of livestock production practices and hence the course content also includes practical and theoretical instruction. But it has been found that due to financial constraints the centres have not been provided with additional teaching personnel, teaching aids, and tools and equipment and farm facilities to undertake animal husbandry training properly. We recommend that at the centres

in districts where Intensive Cattle Development Projects (ICDP) and dairy schemes and poultry and sheep development projects are in operation, special facilities should be created to train farmers in these specific fields. The farms already functioning in the area and other centres established under ICDP such as milk chilling centres, poultry farms, feed plants, wool shearing and grading centres should be fully utilized for the training of farmers from the training schools. Similar attention should be extended to training of farmer and fisherman families in suitable districts. Where fisheries are important similar facilities are to be created and expanded.

54.5.7 Farmers are using machines like tractors, pumps, sprayers, threshers etc. There is a good deal of demand in the rural areas for custom service in tractor operation, spraying, threshing, repair of pumps etc. A reasonably intelligent farmer generally owning machinery can, by a specific training for the particular job within a short time, learn to handle certain machines and maintain them in good condition. Suitable training programmes for various job competence necessary for modern farming should be developed in the farmers training institutions or in other organisations. The purpose is not to give diplomas but to train the farmer to enable him to use his machines and knowledge in a better way himself. The role of Krishi Vigyan Kendra in developing such courses for educated farmers who would like to take up custom services in the rural areas is dealt with in Chapter 53 on Education.

54.5.8 Present training in job competence is in the field of crop production. There is immediate need to train farmers and members of farm families to improve their competence in the profitable processing of livestock products. There are a number of skilled and semi-skilled occupations in which the farm families could be trained for their own benefit. Educated youth could be trained in milk recording and testing castration of stock, artificial insemination, improved shearing and grading of wool, production of milk products like cream, ghee, casein, hide flaying and carcass utilisation etc. which could be organised on a custom basis also to provide additional employment and income to the farm families. As the quality and quantity of wool produced in sheep areas are progressively increasing there would be need for improving intermediate technology and knowhow for processing such wools for local use. Special arrangements should be made in these areas for training artisans, and selected rural farm families in the latest spinning and weaving methods making use of better quality wool.

54.5.9 The Farmers' Education and Training Programme can and should include the education of women in the rural areas. With the spread of education, gradually the number of literate women in the rural areas is increasing. These can take part in the farmers' training programmes without much difficulty. Whilst a substantial part of the training programme can be uniform to both men and women, it will ultimately pay if special curriculum for the women is introduced for the more technical aspects of subsidiary occupation and to change the diet patterns and the production

with a view to having better nutrition. Particularly, the programme of nutrition will be important because as we have pointed out elsewhere, there is a great need in the country for changing the cropping pattern in many areas. The type of cereals grown will have to be changed to suit the agro-climatic conditions even though the local diet patterns may be in favour of the uneconomical crops. It is under these conditions that a proper nutrition education will enable the women of the household to gradually change the existing pattern of diet. This will no doubt have its effect on changing the cropping pattern. Nutrition and health being determined among other factors by the size of the family, farm women should have appropriate population education. This aspect should, therefore, find place in the curricula of farmers' education. The field programme would require the support of extension agency capable of motivating farm women, follow-up and evaluation.

54.5.10 With the introduction of the expanded nutrition programme in Orissa in 1959, and later the introduction of the ANP throughout the country, Mahila Samitis have been formed at the village level in populous villages to develop nutrition awareness amongst the women. Following this, as a part of the programme, training courses have been developed for women. This programme has been very popular. We recommend that the present programme of training farm women should be expanded and intensified and a separate wing should be opened at the farmers' training centre with suitable staff for training farm women. The course content for farm women's training should include

an integrated course on nutrition, child care, better home management and basic health practices in addition to agricultural subjects and production and processing of livestock products.

54.5.11 Motivation of the farmer through adequate incentives and purposefulness should be built in the Farmers' Education and Training Programme. This programme of education is outside the established formal system. Education and training (i.e., why and how) is imparted in unit courses. These units will constitute a particular crop or animal production course or a subject matter course. A number of such crop courses will lead to the complete course on agriculture. But if we emphasise only this part of education it may become dry and monotonous. The farmer is not only a worker/farmer but a home maker and a member of the society also. Therefore, the farmers' education and training must include courses on (a) organisation of various farming activities and farm business (organisation skills), (b) training for better family and home life and relations, including family planning and health (family skills) and (c) training for making him an enlightened citizen of the society.

54.5.12 Enlightened farmers, in due course, may like to learn agricultural science in depth. For them Agricultural Universities, and regional research stations, should organise specific short duration courses in the area of their interest, such as in the field of agronomy, entomology, soil conservation, water use technology, land reforms, poultry keeping, wool production, feeds and feeding, milk products, etc.

54.5.13 Farmers' Education and Training Programme has to be strengthened by other methods i.e., functional literacy which is discussed below and farm broadcasts. Farm broadcasts can be specially designed to stimulate farmers' discussion groups and to create attitudes favourable for the adoption of the new practices. The broadcast programme also provides a two way communication between the farmers and the extension staff.

54.5.14 The All India Radio has introduced in some States an active women's programme. In Coimbatore in Tamil Nadu, for example, such a programme has been in operation for quite some time. Whereas the general farm broadcast can benefit both the men and women, it will be necessary to put across special programmes for women which can emphasise action points in subsidiary occupations programmes and nutritional guidance and culinary instructions. The Mahila Samitis organised under the ANP can be suitably expanded to be the discussion forum for this special programme. It is also essential that in the Churcha Mandals women should also be allowed to take part. The field extension functionaries would be required, in view of their varied experience to organise topical programmes on current issues and future trends.

Functional Literacy

54.5.15 Illiteracy and low level of education of the primary producers is a serious handicap in the modernisation of agriculture. The functional literacy programme for farmers presumes that unless human resources i.e., the ability of the farmers to adopt the improved technology

is upgraded Through training, information, literacy and agricultural know-how, it would not be possible to take full advantage of the improved inputs and practices. The expression "functional literacy", therefore, refers to the linking of the educative programmes with the specific objectives of agricultural development. There is no reason why the process of learning to read and write should not become an opportunity for acquiring information that can immediately be put to practical use. Therefore, it is not merely a literacy programme of 3 R's. The other components of the functional literacy programme are: skill development, attitudinal changes and social awareness. Functional literacy is, therefore, non-formal education programme for training the individual farmers in the developmental skills and processes.

54.5.16 The Farmers' Functional Literacy Programme is an integral part of the Farmers' Training and Functional Literacy Project, jointly undertaken by the Ministries of Agriculture and Irrigation, Education and Social Welfare and Information and Broadcasting. The Programme has been in operation since 1967-68. Starting with three districts, the Farmers' Functional Literacy Project has now reached 100 districts in which the Farmers' Training Programme is under operation. The coordination at the national level is secured through an Inter-Ministerial Coordination Committee which includes the representatives of participating Ministries. At the State level also, there is a coordination committee which includes the representatives of the Departments of Agricu ure, Community Development, Education and the AIR. It is felt tha Extension Directorate at the

Centre and the proposed Directorates of Extension at the State level should be more closely involved in the administration of the Farmers' Functional Literacy Programme.

54.5.17 Sometimes the expression "technical literacy" has also been used for this programme. The programme for functional or technical literacy aims at improvement of the vocational competence of farmers, gardeners, tractor drivers, mechanics, farm managers, stockmen, dairy-men, poultrymen and persons involved in animal production, food processing work etc. It is also to be looked at as a programme which will create self-employment. To sustain interest in learning technical literacy skill, the methods, material and content must take note of felt needs and demonstrate the utility of the skill in satisfying the need. Particular attention will have to be given to bringing those farmers within the fold of the programme who cannot utilise the developmental facilities because they are illiterate.

54.5.18 The essential conditions of the success of a functional literacy programme are the following: (i) availability of appropriate mass communication material and media, (ii) availability of visual teaching aids related to the problems faced by farmers and the technical literacy education, (iii) suitable teachers, and (iv) suitable instructional material based on vocational education principles. Students of agricultural educational institutions and those of multipurpose schools who have taken science as a subject of their study should be selected, trained and utilised for functional literacy

campaigns, besides other educated volunteers, social workers, teachers etc., It is necessary to conduct surveys and identify the felt needs and problems and arrange them in a priority sequence. These felt needs have further to be related to specific job-skills. However, instead of memorising the facts given in the lessons or in the educational campaign material the functional literacy-cum-educational campaign should focus its attention on developing decision making ability of the farmer.

54.5.19 In all schemes of agricultural development and farmers' training, the aim should be steadily to reach the farmer at the lower socio-economic levels. At present, the farmers' training programme is largely confined to the High Yielding Variety Programme. But the needs of the farmers in tribal areas for instance are often wider and include cattle raising, poultry, pig rearing, etc. Therefore, the scope and concept of the farmers' training should be expanded to cater to the needs of different types of farming activities in a particular area.

54.5.20 In the curriculum for training of farmers, farm management including maintenance of farm accounts, should be made an essential part. This subject should receive increasing importance as agricultural development becomes more and more modernised.

54.5.21 In the Farmers' Training Programme, the discussion group plays the key role in the two-way communication as well as acts as a focal point of a continuing educational process by linking the radio broadcasts and other information emanating from the Department of Agriculture as well as the agricultural

university. The transistorised radio receiver is the connecting link at the village end. We commend this idea and recommend the formation of farmers' discussion groups in as many villages as possible.

54.5.22 From the observations made above, it will be obvious that the farmers themselves could take increasing responsibility for bettering agriculture in their respective areas and a responsive and responsible local leadership could emerge, given the right opportunity. Such a spirit on the part of the people should be encouraged so that they assume increasing responsibility and not always depend on outside assistance.

54.5.23 The level of agricultural development in India varies from State to State and region to region according to socio-economic and agro-climatic conditions. Therefore, the training to be imparted to the primary producers, members of their family and the extension functionaries should be flexible enough to fit into the stage of development reached, and also to meet their actual needs.

54.5.24 Each farmers' training centre should maintain the addresses of those farmers who have undergone training at the centre. This list should be handed over to the block authorities and the block staff should be required to keep in touch with these farmers in order to encourage them to adopt new agricultural practices. Similarly, trained farmers themselves should be encouraged to keep in touch with the activities of the centre through correspondence, circular letters, kisan melas and field days.

54.5.25 Farmers' training is so far confined to selected areas. It seems logical that this basic facility should be steadily extended so that it reaches all the farmers in the country as early as possible. The existing educational programmes provided at farmers' training centres are not intensive enough to meet the growing needs of the farming community. We recommend that the allotment of training centres should not be on the basis of the district but by the number of blocks, taking into account the nature of the terrain and other relevant factors. For the present, there should be at least one farmers' training centre for every 15 blocks, irrespective of the size of the district. On this basis, the number of farmers' training centres to be established during the Fifth Plan would be 150, in addition to the existing 100 districts, thus making a total of 250. However, in order to cover all the blocks on the above basis, the number of farmers' training centres will have to be further enhanced during the subsequent plan. This increase would be in keeping with the tempo of development, the rising population and other factors relating to agricultural development.

6 EXTENSION PERSONNEL AND PROFESSIONAL DEVELOPMENT

Extension Personnel at the Block Level

54.6.1 The VLWs and the Agricultural Extension Officers (AEO) are at present the most important communication link between scientific agriculture and the farmer. The bulk of the clientele being illiterate, the most powerful medium is the man to man communication and dialogue along with field demonstrations in which the extension personnel take direct part. It is necessary to keep this personnel up-to-date in scientific knowledge.

54.6.2 Refresher courses of VLWs have two main objects, namely, (a) updating the technical knowledge and (b) practical training at the training centres on new methods and techniques of agriculture. We are of the opinion that the former objective could be achieved through efficient correspondence courses which should also have personal contact programme built into it. As for the second objective, it is necessary to bring the VLWs to the training centre at least once in three years. This would also provide them an opportunity for exchange of ideas and experience among themselves.

54.6.3 The in-service training for officials at block level and above should include both specialised and general education with emphasis on on-going development programmes. The more the number of such courses, the better will be the quality of administration, supervision, teaching, extension education and research activity. These courses should be fairly broad-based to include man-management, preparation of schemes/planning of programme,

budget and accounts, techniques of supervision, uptodate knowledge of subject matter information, office correspondence, techniques of preparing notes, agenda papers, conducting meetings etc. The training should be problem-oriented and job-related to cover all levels of personnel. The refresher course should be revised at intervals of two to five years depending on the field covered and pace of advancement in that field. The training course should be for short duration, i.e., six weeks or so.

54.6.4 In launching a comprehensive programme of in-service training to upgrade the knowledge and skill of personnel working in agriculture and allied fields there is need for devising suitable methods for periodical evaluation of the success or otherwise of such inservice training programmes. This would also enable suitable modifications and corrections in the programme on the basis of the shortcomings that are identified from time to time.

54.6.5 A VLW in an IADP district covers roughly 300 to 400 families. It is not practicable to expect a smaller coverage than this through governmental organisation. In all intensive cultivation areas, the objective should be to reach this minimum coverage per VLW. A VLW will be able to effectively cover the population under his control provided there is a responsive urge on the part of the farmers to learn and improve. It is the field experience that with an economic incentive which modern agriculture gives in several areas of the country, as in Punjab, Haryana and Tamil Nadu, the farmers do come forward and make the work of the VLW easy. Parallel coverage by agricultural experts provided by the input suppliers, the banks

and credit organisations will reduce the per extension worker coverage substantially in areas of intensive development.

54.6.6 The instructional staff of the various vocational institutes may need a special course of subject matter training in order to orient them to the particular type of teaching which they have to undertake in their institutions. This subject matter training can be given in short courses by the agricultural universities. It is also desirable that some of the senior staff members of the agricultural universities are deputed for the staff courses organised on regional and all India basis.

54.6.7 The teachers in the agriculture polytechnics or Krishi Vigyan Kendras should be graduates in the various disciplines, suitably trained in extension education. This training in extension education is all the more necessary for staff dealing with the rural population. Whereas in a regular college it is reasonable to expect that the student will be in a position to grasp the subjects taught which is model for a certain level of literacy and pre-knowledge, the vocational training of the rural folk has to be specially designed to evoke interest and regulate a response in people without a formal education and an educational background. The need for training in extension education is, therefore, obvious. All teachers in the various vocational training institutes must be suitably trained in extension education.

7 ROLE OF VARIOUS AGENCIES

Organisational Framework

54.7.1 There is an Extension Unit at present in the Department of Agriculture which acts in isolation. At the State level, extension and training are handled by the Department of Agriculture. There is, at present, no organisation at the State level to deal with extension and training in the field of animal husbandry, fisheries or forestry. In Chapter 62 on Administration, we have recommended the strengthening of the Directorate of Extension at the Centre. This Directorate should deal with the national problems of training and extension. Home science extension should form an integral and important part of Agricultural extension service. While the programme of home science extension is at present being implemented in isolation and with individual approach and bias, the training of functionaries is being looked after by the Directorate of Extension. As such the training contents do not match with the programme requirements. One single organisation should be responsible for drawing up programme of action, provide leadership, technical guidance and training facilities. The Section of Home Science and Nutrition Education in the Directorate of Extension has got the necessary orientation and capacity for coordinated approach, but it should be suitably strengthened so that it can provide leadership at the national level. All such programmes as are being handled by other departments and Ministries but would be better coordinated by this section should be brought into its fold. We have explained in Chapter 62 on Administration the functions of a suitable Directorate at the State level,

to deal with the problems of extension, training and home science.

54.7.2 In extension or training, or training in non-degree vocational field or in home science, the problems are extremely regionalised. Therefore, control from the Centre in these fields is not desirable. The Central unit should formulate broad national strategies and provide overall guidance. The State units should further expand the national programmes into a detailed frame for the State, taking into consideration the production potential, socio-economic constraints and the level of literacy of the local rural population. Each district training organisation and the Chief Agricultural Development Officer (CADO) will have to further expand these programmes to suit the particular conditions within the regions of the district. Unless each level of the structure understands its limitations and acts, there is likelihood of confusion and consequent inefficiency. While formulating any programme, it is desirable to specify, as far as possible, the limitations of the fields of each of these levels so that there is no tendency to overlap.

54.7.3 At present, agricultural extension is carried out by extension functionaries in the community development block, field level functionaries under special programmes such as IADP, Intensive Agricultural Area Programme (IAAP), commercial crops etc. and voluntary organisations in some States. Agricultural extension is also carried out at the district level by farmers' training centre, under

national demonstration programme and by the agricultural universities in selected areas. Every effort should be made to have proper coordination and integration between these agencies of extension so that the farmer is able to take full advantage of them and multiplicity of agencies is not created. The extension machinery should form an integral part of the agency responsible for agricultural development.

54.7.4 The non-governmental and governmental undertakings and agencies like the National Seeds Corporation, Fertiliser Corporation of India, agro-industries corporation, Indian Dairy Corporation and other similar agencies including the cooperatives should also provide facilities for the training of farmers, farm youth and farm women in the concerned fields. Those non-governmental agencies which are having well qualified staff and are keen on conducting farmers' training need orientation and training of their staff. This should be organised by the agricultural universities/Agriculture Departments.

54.7.5 It is observed that apart from only a few agricultural universities, others are not directly involved in the training of the Gramsevaks. In view of the valuable contribution which the agricultural universities could make in improving the quality of the training of VLWs, we recommend that a close relationship between the Gramsevak training centres and the agricultural universities in the area should be established and maintained. Such a relationship will be mutually beneficial and is likely to yield good results.

54.7.6 It is observed that some States have established their own Kisan Vidyapeeths apart from those sponsored by the Central Government. While welcoming this move, it is suggested that every care should be taken to ensure the quality of training and a uniform pattern in regard to duration, course content, practicals, etc.

54.7.7 We are of the view that the original concept of Rural Institutes as suggested by the University Education Commission (1948-49), should be accepted and adhered to. They should function as centres of education and service to the rural community as agents for all-round rural development with agriculture as the economic base. Their syllabi should be designed to suit rural needs and the studies at those institutes should be related to local problems and conditions. They should continuously organise action-oriented research in the problems of the area of their location. While endorsing the idea of rural institute being affiliated to the neighbouring universities we are of the opinion that the special character and the original concept of these institutes should not be impaired.

Role of Agricultural Universities

54.7.8 Agricultural universities with a strong research programme are bound to be the mainspring of new knowledge in agriculture. If this knowledge is to flow to the points where it could be tested and ultimately utilised - there should be some effective mechanisms. It is in this background that the activities like extensive field trials of new research findings, early demonstrations for illustrating the practicability of new practices and identifying problems

for further research, wider dissemination of agricultural information among those engaged in agricultural development as well as farming community and training of key professional functionaries and progressive farmers become important. Consequently the functioning of the agricultural university in the field of extension should be limited to the following areas:[1]

i) It should be responsible for conducting field trials on the farmers' fields to the extent of testing the research findings and innovations for their applicability and profitability and to organising field extension work in the limited area.

ii) It should organise, early demonstrations with a view to bringing out the practical utility and field application of the new agricultural technology.

iii) Extension agency under the university should serve as a means of feed back for stimulating research on practical problems.

iv) The university should serve as one of the primary sources of agricultural information and assume its role in development of effective communication media including film production and the development of proto-type instruments and appliances.

v) "In the field of extension the university should primarily confine itself to the knowledge input but every research scientist in the university should have contact with the field."[2]

vi) The university may participate in training programmes of progressive farmers, farm youth and farm women along with the Department of Agriculture in order to keep contact with the farmers and farming community.

vii) Further, the university may undertake training of key extension functionaries of the development departments, education and education training institutions.

---

1 Memoranda of understanding between the Directorate of Agriculture, Karnataka State and the University of Agricultural Sciences, Hebbal (Bangalore).

2 Some Aspects of Agricultural Research, Extension and Training, Interim Report, National Commission on Agriculture, para. 10.1, Government of India.

54.7.9 As brought out in our Interim Report on Some Aspects of Agricultural Research, Extension and Training, "In the matter of training of departmental personnel a Joint Training Board has been recommended at the State level, in which members drawn from the State departments and the university are to formulate training programme for the State as a whole. The responsibilities for the training at different levels are to be shared by the State department and the university according to the nature of training to be imparted and the standard of the trainees". Department of Extension education of the agricultural university should co-ordinate field extension activities pertaining to every discipline in the university.

Role of State Government

54.7.10 The State Departments of Agriculture/Animal Husbandry/Fisheries should be responsible for performing extension work, developmental tasks, regulatory functions and ensuring supplies and services. From the view point of efficiency as well as economy, it is necessary that the agricultural university and the concerned State Departments should coordinate their efforts in developing useful activities and in effectively serving the farm communities of the State. In this connection, the recommendations made in the Interim Report on Some Aspects of Agricultural Research, Extension and Training should be followed. The State Departments have to perform the

following functions:

i) overall responsibility for extension work, developmental tasks, regulatory functions and supplies and services, in the field of agriculture;

ii) suggest field problems and formulate new farm technologies through a process of deliberation with the university;

iii) share along with the agricultural universities the responsibility of conducting field trials and demonstrations. Selected extension officers under the department should act as a link between the university and the department for providing the means for the transmission of technical information at the operational level;

iv) establish a common State information cell acting in cooperation with the agricultural university. The State Departments will receive the findings and innovations brought out by the universities and process and convert the research findings into a simple sets of practical guidelines and directions through leaflets, pamphlets, posters and visual aids and other relevant extension and communication media. The Cell should develop annual programmes of farm information based on the various tasks to be performed, viz., training programmes for farm information and communication personnel, organising seminars and discussions for the extension workers and bringing out publicity material;

v) organise training programmes of farmers and field functionaries drawn up by the Joint Training Board; and

vi) maintain uptodate data on the development activities and trained manpower and feed the central agency for evaluation and estimation of the manpower needs of the country.

Central Agency

54.7.11 The Central Directorate of Extension should have the responsibility for coordinating extension and training activities in the country laying down the broad principles for the nation in consultation with the States. Judging the manpower needs and the base of education of the various parts of the country and extending suitable guidance to the State Directorate of

Extension, the Central agency should conduct sample assessment of the extension and the training programmes in the State sector as well as of the Central or Centrally sponsored schemes like national demonstrations, Farmers Training Programmes, information communication, etc. with a view to drawing conclusions of value for modification and improvement of the programmes. The Directorate with the help of the State Directorates should periodically estimate and maintain uptodate data on manpower requirements in the context of development programmes.

8 SUMMARY OF RECOMMENDATIONS

54.8.1 The main recommendations are as under:

1. The operational procedure of National Demonstration Programme needs to be streamlined. The staff located at each of the research stations of the agricultural universities should be encouraged to conduct the national demonstrations around research stations rather than establishing a separate team of national demonstration specialists in a few selected districts.

(Paragraph 54.3.7)

2. The demonstration plot should be within easy reach of the farmers who are expected to benefit by them. There is also need for taking up more of commercial crops in various rotations of demonstration plots so as to meet the needs of different categories of farmers.

(Paragraph 54.3.8)

3. Facilities for mobile soil testing laboratories should be fully utilised for the work of National Demonstrations. Agricultural universities should arrange intensive refresher training programmes for subject-matter specialists in soil analysis so as to make them fully conversant with the latest research in techniques of soil testing. They should also be acquainted with the micro-nutrient deficiency symptoms in the crops.

(Paragraph 54.3.9)

4. Suitable national demonstration programmes should be developed for new programmes such as dry farming, fodder development, horticulture and plantation crops which should be

the responsibility of the research organisations and the technical experts under the State administration.

Paragraph 54.3.12)

5. There should be national demonstrations on the proper use of cross-bred bullocks in different seasons and on other animal husbandry activities such as improved poultry raising, sheep rearing, swine husbandry etc. National demonstrations in fisheries also will have to be developed mostly on Government or institution owned farms for intensive development of water spreads in the surrounding areas.

(Paragraphs 54.3.13 and 54.3.14)

6. The aspects relating to water management technology should form part of the National Demonstration Programmes.

(Paragraph 54.3.15)

7. Greater emphasis is required on systematic test demonstrations or adaptive trials on the farmers' fields in different areas.

(Paragraph 54.3.16)

8. Work and experience under the national demonstrations should be evaluated continuously so that lessons of universal nature are disseminated and there is adequate feedback to the agricultural universities and research stations for better organisation of these demonstrations.

(Paragraph 54.3.17)

9. It is desirable to have adequately large number of demonstrations to ensure sufficient positive results to change people's minds. There should be greater emphasis on intrinsic motivational approach while organising these demonstrations through the educational process rather than through subsidies.

(Paragraphs 54.3.18 and 54.3.19)

10. Extension workers should be encouraged to organise village meetings and discuss the advantages of new practices in order to motivate the local community. Greater attention should be given to increasing achievement motivation of farmers.

(Paragraphs 54.3.20 and 54.3.21)

11. There should be close coordination between extension efforts and the availability of agri-support activities for the rapid transfer of agricultural technology.

(Paragraph 54.3.22)

12. The decisions regarding the format, time and method of dissemination through publicity media should be taken at the district level and made to suit local conditions.

(Paragraphs 54.4.4 and 54.4.5)

13. The information organisation should have close rapport with the research scientists so that the information to be supplied is in keeping with the latest research findings. The central information unit should only disseminate important scientific findings to the administration in the States and leave it to them to disseminate what they think is topical and important from the local angle.

(Paragraph 54.4.6)

14. The films should be topical and of immediate interest and should be properly dubbed in the local language. Films and magic lantern shows should be tuned to the local conditions and requirements.

(Paragraph 54.4.7)

15. The State departments and the agricultural universities should try to make greater use of the local press for disseminating farm information.

(Paragraph 54.4.12)

16. It is necessary that the farmers trained under Farmers' Education and Training Programme are involved in the extension process.

(Paragraph 54.5.4)

17. The farmers' training centres and the Gramsevak training centres should, as far as possible, be located on the same campus and a senior officer should be incharge for coordinating the activities of the training centres and production programmes in the district.

(Paragraph 54.5.5)

18. The farmers' training centres in districts where Intensive Cattle Development Projects and dairy schemes and poultry and sheep development projects are in operation, special facilities should be created to train farmers in these specific fields

(Paragraph 54.5.6)

19. There is immediate need to train farmers and members of farm families to improve their competence in the profitable processing of livestock products.

(Paragraph 54.5.8)

20. Farmers' Education and Training Programmes should include the education of women in the rural areas also. A special curriculum for women should be introduced for the more technical aspects of subsidiary occupations and to change the diet patterns and the production with a view to having better nutrition. Farm women should have appropriate population education. These aspects should be included in the curricula of farmers' education.

(Paragraph 54.5.9)

21. The present programme of training farm women should be expanded and intensified and a separate wing should be opened at the farmers' training centre with suitable staff for training farm women.

(Paragraph 54.5.10)

22. Farmers' Education and Training must include courses on organisation skills, family skills and continuing educational skills.

(Paragraph 54.5.11)

23. It will be necessary to put across special programmes of broadcasts for women emphasising action points in subsidiary occupations and nutritional guidance and culinary instructions. The Mahila Samitis organised under the Applied Nutrition Programme can be suitably expanded to be the discussion forum for this special programme.

(Paragraph 54.5.14)

24. The Extension Directorate at the Centre and the proposed Directorates of Extension at the State level should be more closely involved than at present in the administration of Farmers' Functional Literacy Programme.

(Paragraph 54.5.16)

25. Particular attention will have to be given to bringing those farmers within the fold of the functional literacy programme who cannot utilise the developmental facilities because they are illiterate.

(Paragraph 54.5.17)

26. The functional literacy-cum-education campaign should focus its attention on developing decision-making ability of the farmer.

(Paragraph 54.5.18)

27. The Farmers' training should embrace the farmers at the lower socio-economic levels. The scope and concept of farmers training should be expanded to cater to the needs of different types of farming activities characteristic of a particular area.

(Paragraph 54.5.19)

28. In the curriculum for training of farmers, farm management including maintenance of farm accounts should be made an essential part.

(Paragraph 54.5.20)

29. Farmers' discussion groups should be formed in as many villages as possible.

(Paragraph 54.5.21)

30. The allotment of farmers' training centres should be by the number of blocks. For the present, there should be at least one farmers' training centre for every 15 blocks irrespective of the size of the district.

(Paragraph 54.5.25)

31. It is necessary to bring the VLWs to the training centres at least once in three years for practical training on new methods and techniques of agriculture.

(Paragraph 54.6.2)

32. The refresher course for extension personnel should be revised at an interval of two to five years depending on the field covered and pace of advancement in that field. The training course should be of six weeks or so.

(Paragraph 54.6.3)

33. Agricultural universities can provide facilities for subject matter training to the instructional staff of the various vocational institutes. It is also desirable that some of the senior staff members of the university are deputed for the staff courses organised on regional and all-India basis.

(Paragraph 54.6.6)

34. The teachers in the agricultural polytechnics or Krishi Vigyan Kendras should be graduates in the various disciplines and suitably trained in extension education.

(Paragraph 54.6.7)

35. The section of home-science and nutrition education in the Directorate of Extension at the Centre should be suitably strengthened so that they can provide a desirable national leadership. All such programmes handled by other departments and Ministries should be brought into its fold.

(Paragraph 54.7.1)

36. There should be no control from the Centre in the field of extension or training, vocational education or in home science. The responsibilities of each level should be clearly defined so that there is no tendency to overlap.

(Paragraph 54.7.2)

37. Every effort should be made to have proper coordination and integration among the various agencies of extension, i.e., normal block agency, extension staff under special programmes, farmers' training centres, national demonstrations and the agricultural universities, so that the farmer is able to take full advantage of them and multiplicity of agencies is avoided.

(Paragraph 54.7.3)

38. The non-governmental and governmental undertakings like the National Seeds Corporation or the Fertilizer Corporation of India and similar other agencies like cooperatives should provide facilities for the training of farmers, farm youth and farm women.

(Paragraph 54.7.4)

39. There should be a close relationship between the Gramsevak training centres and agricultural universities.

(Paragraph 54.7.5)

40. The original concept of the rural institutes as suggested by the University Education Commission, 1948 should be accepted and adhered to.

(Paragraph 54.7.7)

41. The role of the agricultural universities in extension should be confined to conducting field trials for testing the research findings, development of agricultural technology and demonstrating its practical utility, provision of farm advisory service up to the district level, functioning as a source of agricultural

information, development of effective communication media, participation in training programmes etc.

(Paragraph 54.7.8)

42. The Departments of Agriculture/Animal Husbandry/ Fisheries at the State level should have overall responsibility for extension work and should also be responsible for suggesting field problems and formulating new farm technology, conducting field trials and demonstrations, a common information cell along with the agricultural university, organisation of training programmes etc.

(Paragraph 54.7.10)

43. The Central Directorate of Extension will be responsible for coordinating extension and training activity in the country, and laying down the broad principles for the nation in the field in consultation with the States. The Central agency should also conduct sample assessment of the extension and the training programmes with a view to drawing conclusions of value for improvement of these programmes. It should also maintain uptodate data of manpower requirements in the context of development programmes.

(Paragraph 54.7.11)